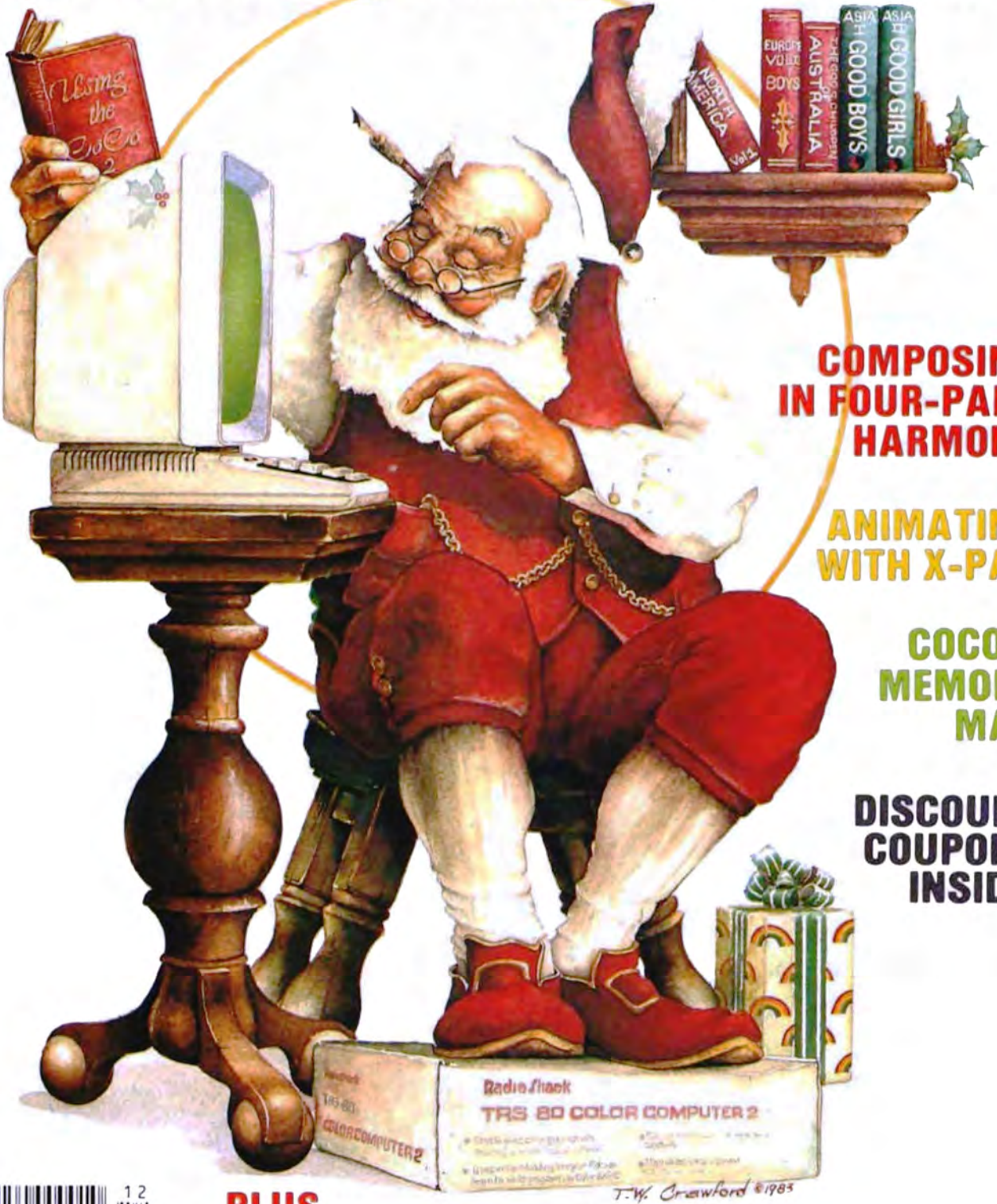
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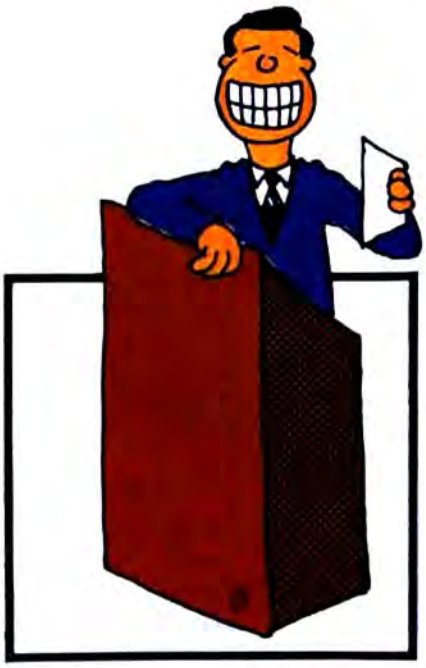
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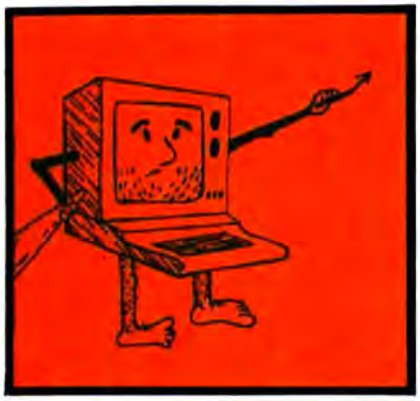
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NEXT MONTH: Since January begins a new year, and the month is named for the twin-faced god Janus, who looks both backwards and forwards at once, the symbolism the month provides lured us into making the January *Rainbow* our beginner's issue. While there'll be plenty of material for the sophisticated, we'll also be running programs and articles specifically geared to the newcomer and those with limited experience on the CoCo. Some old hands such as Jorge Mir will help us all protect against I/O Errors, and among the games and other BASIC programs, you'll find one exercise designed to help newcomers to the keyboard become capable typists.

Look for the January *Rainbow* with all its features you've come to expect and enjoy.

The RAINBOW

December 1983 Vol. III No. 5

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The Rainbow is published every month of the year by FALSOFT, Inc., 9529 U.S. Highway 42, P.O. Box 209, Prospect, KY, 40059. Phone (502) 228-4492. **The RAINBOW** and the Rainbow logotypes are ® Trademarks of FALSOFT, Inc.

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Subscriptions to **the RAINBOW** are $22 per year ($28 after Jan. 1, 1984) in the United States. Canadian and Mexican rates are U.S. $29 ($35 after Jan. 1, 1984). Surface mail to other countries is U.S. $57 ($65 after Jan. 1, 1984), air mail U.S. $85 ($100 after Jan. 1, 1984). All subscriptions begin with the next available issue.

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letters to RAINBOW

COMPLIMENTS TO THE CHIEF

Editor:

We read Lonnie Falk's editorial and would like to compliment him on what we feel was a very sensible, thoughtful commentary on an extremely sensitive subject. You are aware of how serious the software theft problem is and how drastically it affects our sales. As you know, none of our software is protected. We rely on the integrity of the public to remain in business and comments such as his will help us to do so.

Ron Krebs
Mark Data Products

Editor:

I have several comments to make about the editorial in the October issue of *Rainbow* concerning pirating.

Just the other day some CoCo friends of mine were discussing this very problem. The general consensus of opinion was that pirating is a result of the nature of the art. To develop a better software protection device is to challenge programmers to break it.

There is also the problem of shoddy programs being sold to people for not so shoddy prices. Just recently I purchased an address and mailing label program which cost $17.95 plus sales tax and $2 shipping. It is worthless to me. The program I am using came to me from *Chromassette* to which I subscribe. If *Chrommasette* can put out an excellent program along with five or six other programs on one cassette for $5 and another firm puts out a lousy program for $17.95, who is the pirate?

If pirates can threaten the software industry how do you explain the success of the recording industry? For every computer program that has been copied there must have been thousands of records and tapes copied; however, RCA and Columbia have survived.

You mentioned the software companies that have gone out of business. Just possibly there were other factors that contributed to their demise. As you know, everyone wants an alibi.

William Auman
Bella Vista, CA

CHRISTMAS ADVENTURES

Editor:

I would like to know when or if you plan to be finished with the Adventure Book of programs from the last contest?

John D. Cleveland
Lunenburg, N.S., Canada

Editor's Note: *The Rainbow Book of Adventures*, our first book, will be available around Christmas at many stores, including your local computer store and through us directly.

INFORMATION, PLEASE

Editor:

Perhaps one of your readers can help me with a problem. I have the 16K CoCo "D" board, upgraded to 32K, two disk drives and the Okidata 82A printer.

The local Radio Shack stores ran a close-out sale of the TRS-80 Videotex Terminal (25-5001) for $99. The regular price was $399. I wanted a Modem but the price was so good, I bought the Videotex Terminal. (I think I should have spent the additional price and bought the Modem instead.)

Although the Terminal works fine, it will not allow me to make printouts, as there is no provision for signal output except to a monitor.

First, I would like to upgrade to 32K on the Videotex Terminal. I feel pretty sure that I can use the same procedure that I used in upgrading the CoCo.

Secondly, and the main reason for this letter, I am trying to find a way to feed a signal from the Videotex Terminal to the RS-232 port of my Color Computer, so that I can make use of the printer. I have the manuals and schematics of both units, and also have the Videotex program on tape. But is it needed? I have no objections to "digging into" the printed circuits *if necessary*. I sure would appreciate information from someone who might have done this. I've contacted several Radio Shack Computer Centers and they have said that it can be done, but no one has had the knowledge to tell me how.

My address is 214 Russell Avenue, 08007. Thank you.

Bill Helmetag
Barrington, NJ

Editor:

I'm interested in obtaining information with regards to updating my Color Computer version D to the current version. After studying the printouts of the 16K RAM versus the 64K RAM, it appears that it is only necessary to modify three printed circuit-board traces to upgrade the memory to 64K. In addition, it appears that it would only be necessary to make the change which allows the video pages to high order memory and to install the BASIC ROM version 1.2.

Any information you have concerning this possible modification will be greatly appreciated.

Joe. H. Apple
Walkersville, MD

Editor's Note: See B. H. Alsop's article "64K Modification for 'D' Board" in the March 1983 *Rainbow* (page 100). Be sure to cut Pin 4 instead of Pin 5 as corrected in the August issue.

HOW TO LEARN THE LANGUAGE

Editor:

I am a proud owner of a recently acquired TRS-80 32K Extended BASIC Color Computer, and am anxious to put it through its paces.

I started using BASIC shortly after Professor Kemeny first published at Dartmouth, and I find the variations in the language fascinating.

Now I would like to become acquainted with 6809 assembly language. Would you help?

Art Bridgman
Pittsfield, MA

Editor's Note: See the next letter and read assembly language columns in *Rainbow*. Good luck!

Editor:

My name is Lee Perkins, III and I'm 15 years old. I am planning to get an editor and assembler (*EDTASM+*) for my birthday. I had a chance to look at one at a nearby Radio Shack, and I found the instructions confusing.

I would like to try to make a voice synthesizer, but I don't know how to make the editor and assembler make sound. In BASIC, it's just *SOUND X,Y*, but how do you do it in assembly language? Also, do you think you could give me a few pointers on how to make assembly language programs?

L. Perkins, III
Norfolk, VA

Editor's Note: Radio Shack has a new book called "Color Computer Assembly Language Programming," Cat. No. 62-2077. Maybe this will solve your problems.

Editor:

Does anyone know why all CoCos cannot accept the high-speed, *POKE 65495,0* command? Is it a ROM-based problem? Does the fault lie within certain 6821 PIAs? Most sources of information seem to shy away from the question or ignore it completely, but the speed up is a highly attractive feature which can be very useful and all CoCos should be able to perform it. Until the problem is solved, there is a "semi-radical" (but apparently harmless) solution at hand.

Robert Brooks, in a letter published in the September 1982 issue of *80 Micro* (page 26), suggests removing capacitors C73 and C75 in order to achieve reliable operation of the CoCo in the speed-up mode. He also states that every CoCo he has converted in this manner performs properly and that he has no idea why the capacitors are there in the first place.

After reading his letter, I removed C73 and C75 from my D Board model CoCo

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COLOUR SOFTWARE WORKBENCH

RAINBOW CERTIFICATION SEAL

The Colour Software Workbench is a complete software development system for those who wish to do comprehensive program development on their TRS-80 Color Computer. The Colour Software Workbench transforms the TRS-80 Color Computer from a "BASIC Machine" into a "Real Computer System" by providing Color Computer users with the same tools and facilities used by professional programmers in the field. For those who want to program in an English-like language but don't want to pay the price of slow program execution, the Colour Software Workbench is ideal. The Colour Software Workbench allows Color Computer users to write their programs in the familiar English-like expressions of PASCAL while achieving the execution speeds of machine language with the Colour PASCAL Compiler.

TEXT EDITOR

The Colour Text Editor is a screen mode, in-memory, text editor which provides its users with a selectively moveable "window" into a text file. The Colour Text Editor was designed primarily for the development of program source code, but it can also be used in conjunction with some text formatting capabilities (which you "install" as a learning exercise) for the production of software documentation. As an example, this text and the CSW User's Guide were both developed with and produced by the Colour Text Editor and the "Text Formatter".

The Colour Text Editor is an excellent tool for developing PASCAL and ASSEMBLER source programs. The Colour Text Editor manipulates blocks of text efficiently and minimizes delays imposed by the speeds of I/O devices such as the Color Computer's floppy disk drive(s) or cassette tape recorder. The Colour Text Editor provides automatic left-right/right-left and up-down/down-up scrolling in conjunction with powerful FIND and CHANGE commands. Additional commands facilitate the replication of text blocks as well as their bulk movement within a text file. Text files created with BASIC are compatible with the Colour Text Editor. With the Colour Text Editor text files can be read and optionally merged from either cassette and/or disk and may then be written to either cassette, disk, or the printer. It should be mentioned that all of the keys have an auto-repeat capability.

PASCAL COMPILER

The Colour PASCAL Compiler is a fully recursive PASCAL language compiler which processes PASCAL program statements into machine executable binary for the TRS-80 Color Computer's 6809 micro-processor. The Colour PASCAL Compiler provides Color Computer programmers with PASCAL as an ideal "Systems Programming" language or the ability to write programs in the English-like "High Level" expressions of PASCAL without any sacrifice of program execution speeds. The Colour Text Editor, 6809 Macro Assembler, and Colour Linker were all written in PASCAL and produced by the Colour PASCAL Compiler and they, like the ROM Monitor software of the TRS-80 Color Computer, are machine executable programs.

The Colour PASCAL Compiler is a device-independent software package designed to economically translate PASCAL source programs into efficient 6809 micro-processor machine programs in one pass. Program source files may be read from either cassette or disk with the resulting machine program object files written to either cassette, disk, or the serial I/O port. The Colour PASCAL Compiler parses and evaluates PASCAL language statements and declarations and generates the corresponding 6809 micro-processor machine programs in accordance with "Standard PASCAL" language syntactical rules and conventions. The Colour PASCAL Compiler supports all "Standard PASCAL" features with the major exceptions being real or floating point arithmetic and pointers. Many University of California at San Diego (UCSD) PASCAL features are also supported in conjunction with some additional comprehensive extensions which enhance both the PASCAL language and its TRS-80 Color Computer implementation. The Colour PASCAL Compiler is also equipped with powerful compiler directives and comprehensive source listing aides, such as meaningful error messages and optional corresponding assembler language representations of all PASCAL statements.

OBJECT LINKER

The Colour Linker is a program which reads the program object files produced by both the Colour PASCAL Compiler and 6809 Macro Assembler and converts them into machine executable binary image files, "Load Modules", suitable for loading with the Color Computer's LOADM command. The Colour Linker can also read multiple program object files and combine them into one larger machine executable binary "Load Module" so as to allow Color Computer users to develop very large programs one piece at a time. The Colour Text Editor, Colour PASCAL Compiler, 6809 Macro Assembler and Symbolic On-Line Debugger, were all developed with the Colour Linker.

The Colour Linker is an excellent tool for the development of "Load Modules" from either or both PASCAL and ASSEMBLER object files. The Colour Linker is a device independent software package, comparable to linkage editors found on industry computers. It is capable of linking up to thirty program object files into one machine executable load module. Up to three hundred public symbols can be defined for all object files to be linked by the Colour Linker. The Colour Linker supports object code relocation, automatic Colour Software Run Time Library module inclusion, and a built in Symbolic On-Line Debugger interface. All machine executable binary load modules produced by the Colour Linker are compatible with the Color Computer's BASIC monitor, and, during their production, the Colour Linker generates load maps and error messages so as to report the status of any linking operation.

The Colour Software Workbench requires a TRS-80 Color Computer to be configured with at least 32K of memory, Extended Disk BASIC, and one floppy disk drive.

The Colour Software Workbench is a complete set of software development tools designed to support a programmer through the process of creating computer programs: from the entering of source code through the execution of the resulting machine program. The Colour Software Workbench is comprised of the following software packages:

MACRO ASSEMBLER

The 6809 Macro Assembler is a Motorola compatible macro assembler which processes Motorola 6809 Assembler language program statements into machine executable binary for the TRS-80 Color Computer's 6809 micro-processor. The 6809 Macro Assembler makes it easy to write Motorola assembler language programs which are compatible with PASCAL programs developed with the Colour PASCAL Compiler. The 6809 Macro Assembler is a powerful tool which enables Color Computer users to develop programs which are best suited for assembler language implementation. The Colour PASCAL Compiler and Symbolic On-Line Debugger were both written in Motorola 6809 Assembler language and produced by the 6809 Macro Assembler. The 6809 Macro Assembler fills any software development gaps not closed by the capabilities of the Colour PASCAL Compiler so that in its entirety, the Colour Software Workbench will support any program development effort that a Color Computer user may wish to attempt.

The 6809 Macro Assembler is a device-independent software package designed to economically translate Motorola 6809 Assembler source programs into 6809 micro-processor machine programs in two passes. Program source files may be read from either cassette or disk with the resulting machine program object files written to either cassette, disk, or the serial I/O port. The 6809 Macro Assembler parses and evaluates Motorola 6809 Assembler language statements and declarations, and generates the corresponding 6809 micro-processor machine programs in accordance with Motorola 6809 Assembler language syntactical rules and conventions. The 6809 Macro Assembler's powerful macro facility allows Color Computer users to define their own "Macro" instructions: the ability to write an assembler language subroutine using only one macro instruction to identify it in the source program. Each Macro instruction defined to the 6809 Macro Assembler may have up to nine parameters for argument passing between macro subroutines. The 6809 Macro Assembler's object code format provides for program relocation, separate assembly, and easy interfacing to PASCAL via the Colour Linker. The 6809 Macro Assembler supports all Motorola 6809 Assembler mnemonics as well as several declaration extensions which simplify the interfacing of 6809 Assembler programs to PASCAL programs at the source code level. The 6809 Macro Assembler is also equipped with powerful assembler directives such as the COPY facility which provides the ability to include other source programs as parts of one larger source program. Source listing aides include such essentials as meaningful error messages and source listing control options.

SYMBOLIC DEBUGGER

The Symbolic On-Line Debugger, when linked to a program developed with the Colour Software Workbench, provides its users with a "window" into the Color Computer's 6809 micro-processor's execution of that program at the machine level. The Symbolic On-Line Debugger was designed to allow a programer to selectively control the execution of a program, see the actual contents of the Color Computer's memory and the 6809's internal registers during that program's execution. The Symbolic On-Line Debugger's user may reference sections of a program with the same symbolic names that were used in the programs source code rather than with memory addresses so that the user need not be a computer wizard in order to debug a program at the micro-processor level. The Symbolic On-Line Debugger also allows its users to change the contents of both the Color Computer's memory and the 6809 micro-processor's internal registers so that temporary program fixes and experiments can be performed as the program is being executed.

The Symbolic On-Line Debugger is an excellent tool for debugging machine programs developed in either PASCAL or ASSEMBLER. The Symbolic On-Line Debugger allows a user to stop and start a program under test at almost any point. Once the program under test has been stopped, the Symbolic On-Line Debugger allows the user to select any memory location or micro-processor register for the display of its contents. The Symbolic On-Line Debugger user may then select any memory location or micro-processor register and enter a new value for replacement of the previous value. For example, when entering a number for a contents replacement, an expression may be entered which is converted and stored by the Symbolic On-Line Debugger. The Symbolic On-Line Debugger provides a "Trace" facility which lists all of the active procedures within a program, by name, in order of their activation by the 6809 micro-processor, thus providing a "procedure call" history. The Symbolic On-Line Debugger automatically preserves the screen of the program under test whenever that program is stopped, and automatically restores the screen of the program under test whenever that program is restarted. This makes the Symbolic On-Line Debugger very handy for use with applications using graphics.

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and, wonders of wonders, I'm now able to use *POKE 65495,0!* I have yet to experience any problems at all as a result of this "modification" and, at this point, can recommend it to anyone whose CoCo can't handle the speed-up otherwise.

Barry Pattengill
Waco, TX

Editor's Note: See Tony DiStefano's article in the January 1983 *Rainbow*, "High Speed *POKE* Has Effect On CoCo Hardware."

WHAT'S YOUR NUMBER?

Editor:

In reference to your article on the October 1982 issue on conversion to 64K, by Bob Rosen, how can I check what computer board I have in my computer, and, if the conversion can be done on a computer equipped with Extended BASIC. My computer serial number is 01691. I would be very grateful for your kind reply.

Onkar Singh
Winnipeg
Mannitoba

Editor's Note: See the next letter.

Editor:

I just received my first issue of *Rainbow* from a friend. It's above great. I was very interested in September's "Pipeline." I own a late model CoCo 32K Extended Color BASIC machine which I purchased with the intent of upgrading to 64K immediately after the warranty period expired. I've been trying to locate a reputable supplier for the 64K chips when I began hearing rumors about the late F boards already having 64K chips installed from the factory. Your article seems to indicate that the upgrade requires only minor labor to perform the necessary modification to 64K in the late machine. The serial number on my machine is 0000815. The model number is 26-3003A. Also, other sources indicate that by adding disk drives and Flex or OS-9 that I could already utilize the built-in 64K in my machine.

Do I have the late model machine and could you help clear up my confusion? Your help in this would be greatly appreciated.

Gene Deal
Park City, UT

Editor's Note: The code on your printed circuit board is the key. If your board's serial number ends in --285, you already have 64K and can run "Flex" and "OS9."

Editor:

I am fairly new to computers and very new to your magazine, and I sure have been missing out on a lot in invaluable information! Therefore, what I am about to ask has probably been covered in a past issue of your magazine, but for the benefit of myself and all the other newcomers out there who may have missed it before, here goes.

I have a 16K, Extended BASIC Color Computer with which I am very happy. However, like a lot of other people, I want more memory. I have bought a kit for a 64K upgrade of the computer, but I want a verification from someone I know will tell me right before I actually install it. (Yes, you might say I am nervous about going inside!) It is a fairly new computer, and I have the F-Board. I assume the chips bought in 64K upgrade are 64K chips, so I suppose all I will have to do is cut a few capacitors and change three jumpers, and add one jumper. But I would very much like to hear from a reliable source before I actually attempt it.

Barry L. Bond
Miami, FL

Editor's Note: According to the most recent Radio Shack catalog, you can have a service technician upgrade your CoCo for $149 or do it yourself for about $50. It's your decision, but we would recommend doing it yourself.

Editor:

When my disk drive and controller are connected to my computer and powered up, the system becomes extremely sensitive to line voltage fluctuations. The screen will go blank and the entire system will reset, losing all the data I have in memory. It does this only occasionally, and on returning the system to Radio Shack for service, they informed me that my system was operating correctly, and there was nothing they could do. Of course, Radio Shack Service Centers all use dedicated power lines, so line voltage fluctuations in the store are not a problem.

My local Service Center has informed me that I have three options: 1) install a dedicated power line in my home; 2) modify my system by installing a power supply for the disk controller and drive boards; or 3) purchase a line voltage conditioner or an uninterruptable power supply.

The first option is out of the question, as I currently reside on Barksdale Air Force Base. The second solution involves modifying the system to the point where neither Shugart or Radio Shack could support, and the third option involves a cost comparable to my entire system. Help!

Frank W. Gorhau
Barksdale AFB, LA

Editor's Note: There is no easy way to solve your problem. It is due to the line voltage fluctuations mentioned by your Radio Shack dealer. The only thing we can suggest is locating your computer on a circuit near the panel with no other appliances such as washers, electric heater, etc. These devices cause the voltage drops. By locating your CoCo near the panel, these problems are minimized but never disappear.

Editor:

I enjoy reading *the Rainbow* magazine. I have just recently acquired a disk drive for my Color Computer. I have a cassette and a Line Printer VII also. I have begun the never-ending search for software. I am looking for a specific program which I have not been able to find. Let me describe it: It is a printer program which takes the regular size characters (as are used in this letter) and uses them to create larger characters of that same letter. It could possibly be called a poster program or banner program.

I have seen several programs in your magazine, as well as others, but have not found the program I want. I would like the program to have adjustable-size for the characters and to include the special characters also.

I would appreciate all the help you could give in helping me to locate such a program. Thank you very much for your time and effort. Keep up the good work.

Grant S. Porter
Opa-Locka, FL

Editor's Note: Check *Big Print* by Michael J. Himowitz in this issue.

KUDOS

Editor:

As my time comes near the end here in Saudi Arabia, I must take time out to say "Thanks" for the best bargain ever—*the Rainbow*—which I subscribed to last October while I was in the U.S. It ws a good magazine then—better as the year went on—and now even better and bigger.

Your new subscription rate is still a super bargain. In fact you aren't breaking even on postage and I still get *the Rainbow*. Its worth much more than the $85 rate. How do you do it?

October 1983 just arrived, six days after postmarked in Prospect, Ky. It took only four days to get here, then two more for Saudi post to get it into my mailbox.

Again, thanks for a fantastic magazine. Keep up the good work.

Bill Baker
Plano, TX

Editor:

I've been a subscriber since November 1982 and can't wait for each new issue. Your magazing is fantastic. It is one of the best learning resources for the CoCo I've seen.

I paste a strip of white paper on the cover of each issue and jot page number and title on subject of each item that I can make use of — present or future. "Hints" that you tuck away, here and there are tremendous.

J. Stewart Campbell
Ocean City, NH

RAINBOWS ARE MIRACLES

Editor:

Okay, I give up! I have enclosed my subscription for *Rainbow On Tape*. For awhile I kept spending more and more money on subscriptions to additional Color Computer magazines and avoided the additional cost of taped programs. Not that you need the pat on the back, but I'll give it any way. Not only is *Rainbow* head and shoulders above second best, and miles above others, it finally has too much each month that I want to see and use but don't have the time to keypunch.

I am really hard pressed to find anything to even recommend to enhance the miracle you have created in so short a period. (I just cancelled a subscription to a competitor,

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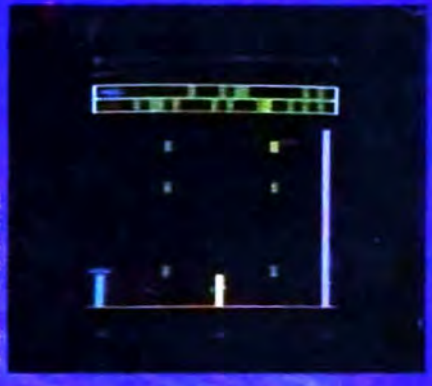
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who in nearly the time period has grown bigger, but failed to get better. Worse yet, I finally could no longer stand the journalistic professionalism they lack, but which you have consistently displayed in quantum jumps.)

Bob Coldwater
Univeral City, TX

NEW BBS

Editor:

I've started a BBS in Santa Barbara, Ca. 300/1200 Baud, 24 hour operation. Uploads and downloads for the Color Computer. Phone (805) 687-9400.

The CoCo Corner BBS
Jim LeDoux, Sysop
Santa Barbara, CA

A MICRO MOVE

Editor:

Would you please be so kind as to inform your readers that Micro Technical Products, Inc. is moving. Our new address will be:

Micro Technical Products, Inc.
814 W. Keating Avenue
Mesa, AZ 85202

Thank you much.

Roger L. Degler, President
Micro Technical Products, Inc.

BOUQUETS & BRICKBATS

Editor:

Recently I wrote to Owl-Ware, one of your regular advertisers, with an unusual request, which would mean no profit for them. I asked if they would consider my request and how much they would charge. Today I received what I requested in the mail, with no mention of charges; not even handling or postage.

Owl-Ware can rest assured they will get more of my business in the future. I'm pleased to deal with people who have such a helpful, pleasant attitude.

Fred Sawtelle
Huntsville, TX

Editor:

I just received Key Color Software's *KEY-264K* program and I am so impressed that I thought I should pass along my comments. When I saw the ad, I though: that the price was a bit high for just flipping through two sections of memory, but now that I have it I must say that I'm very impressed with all its unusual features and the documentation was the best I have ever had from any software source.

I hope that Neil Capeless is successful in marketing this fine program and that he will come up with some other useful programs equally well written and documented.

Francis Sherwood
Ft. Pierce, FL

Editor:

I would like to compliment one of your advertisers. I ordered a 32/64K Color Computer from Computer Plus in November 1982. In April 1983, it developed an intermittent problem that rendered it unusable. The machine was returned and the interior components were replaced at no charge. I was amazed at the speed with which this was accomplished as it took only about one week—including shipping time. I could not ask for better service than that.

Thanks also to *Rainbow* for a very good magazine.

A.L. Karger
Moorhead, MN

HINTS AND TIPS

Editor:

In response to Mr. McMann's letter (August 1983) regarding the adventure game *Pirates Ahoy* I offer the following advice.

1) In this adventure, common sense prevails.
2) Look closely at everything.
3) If you can get and carry something, take it with you.
4) Map your progress.

Specifically, to get out to sea, do the following: 1) Gather all items possible on the shore and store them in the boat. 2) Oar locks are found by digging in the sandpit with the shovel. 3) Give the gold coins to the pretty attendant to get hot dogs in return.

Go Boat: 1) Put oarlocks in the boat. 2) Put oars in the locks—(so you can row). 3) Release the boat—(you can't move if still tied to the dock).

You may now "row" the boat.

Best of luck on your voyage, mate!

Gerald Casey
Prince Rupert, B.C., Canada

Editor:

For all of the good folds who are trying to get out of *Bedlam*, use the long-handled window hook. Stand *outside* the therapy room and get the green key with hook. The window hoop appears to be a very useful tool.

Does anyone know if a software/hardware package is available that will allow me to receive slow scan pictures such as weather satellite, or FAX with the CoCo?

Dan Clark
Laurel, MD

Editor:

As a new user of the CoCo 32K machine I find your magazine very interesting and informative.

In the short time I've owned it I had the opportunity on several occasions to use some of the machine language programs you've printed. I'm sorry to say, though, at times some have had disastrous results. (The worst case was my disk #1 being initialized for no apparent reason.)

While using your "Rainbow Check" program as published in the June 1983 *Rainbow*, (after it was saved on disk with the *SAVEM* statement) I believe I've stumbled upon the culprit. After a *LOADM* and *EXEC*, the check program was executing without any problems. I was loading a BASIC program when I decided to use the HEX$ statement to convert decimal digits to hex. Almost every time I used the HEX$ statement my system did weird things. Investigation into this revealed that the last three memory locations used by your check program was also used by the HEX$ statement to store its decimal conversions. This caused your check program to sometime fly off into "no man's land," depending on what instruction the hex conversion was interpreted to be.

After some thought on this I would think that the system would provide some "software memory protect" pointers that would not allow one machine language subroutine to interfere with another, such as the *CLEAR* statement in BASIC. Can you comment on how this would be done?

Bill Sobczak
Mesa, AZ

Editor's Note: Thanks for the tip, Bill. We know of no way to protect machine language programs other than the *CLEAR* statement you mentioned.

IT'S NOT ALWAYS OK

Editor:

Are you tired of seeing the "OK" prompt forever on the screen, especially after your favorite program has just bombed? You can change this if your 80C has been converted to 64K. All that is required is to be in the all RAM mode and key in the following:

```
POKE &HABEE, &H2B: POKE
&HABEF, &H2B.
```

This will change the prompt to ++. You could use any other symbol of your choice.

I initialize my computer upon start-up with this sort routine.

```
10 LOAMD &H64K: EXEC
20 POKE &HABEE, &H2B: POKE
   &HABEF, &H2B
30 NEW
```

With this you can run all your favorite programs without affecting their operation.

Edgar H. Poulin
Sherbrooke, Quebec, Canada

Editor:

I agree with the recent complaint letters regarding a lack of programs for non-Extended owners. I am enclosing an early program of mine to help fill the gap. If we all do this, *Rainbow* can be of more value to all of us.

Also, for non-Extended users, here are a few discoveries that some may not yet know of:

1) Even though the Radio Shack manual states otherwise, my 16K CoCo will accept PRINTTAB. For example, use PRINTTAB (12)"MENU." Do not use any spacing or you'll get a "BS Error."

2) By pressing and holding [SHIFT] and then [CLEAR], you will produce a backward slash "\."

3) Hold [SHIFT] and press the [−] and you generate a square bracket "]."

4) To get the matching bracket, "[," hold [SHIFT] and then press the [↓].

5) Holding [SHIFT] and pressing the [↑] will produce a left-pointing arrow, [←].

This "Letters to Rainbow" section of the magazine is a favorite with me; a real learning experience. A special *thanks* to the Editor!

W. Maxwell
Carlisle, PA

PRINT #-2,



First the bad news . . .

As I said a month ago, we are being forced to raise our subscription price. This will take effect on January 1, 1984. The new price will be $28 for subscriptions in the United States, $35 (in United States currency) for subscriptions in Canada and Mexico, and $65 for foreign surface and $100 for foreign air mail subscriptions, all in U.S. dollars only.

With this announcement, I hope you will understand that, from our perspective, we are *not* raising *your* subscription rate. As we did a year ago when we last raised the cost of subscriptions, we will allow you to sign up *now* for a subscription at the old rate ($22 in the U.S., $29 in Canada and Mexico, $57 foreign surface and $85 foreign air mail — all in U.S. dollars).

So, even if you just sent in a subscription (or just renewed your old subscription), you can send in for another full year at the current rate — so long as that renewal reaches us by January 1, 1984. So, you can keep *the Rainbow* coming to you every month, and extend your subscription out for an entire additional year, at the present rate that you are now paying. Our increase will affect only new subscriptions, or renewals, which are received *after* January 1, 1984. So, if you want to take advantage of our offer of an entire year's subscription at the present (think of it as discounted) rate, then just make sure that we get your order or renewal for an additional 12 months before January 1, 1984.

Yes, I know this is the December issue and, on the face of it, it does not look like we're giving you a whole lot of time. But, remember, we pre-date the issues by a month and this one should reach you something like the middle of November — so we're giving you more than a month's notice to act on our discount renewal offer. And, yes, holiday gift subscriptions can be had at the discount renewal rate, too, because the new prices do not go into effect until after the Season.

Frankly, we should have raised the subscription price a couple of months ago. The reasons are simple and I hope that you will be willing to bear with me as I explain the reason for this increase.

In the last year, you will find that we have doubled the size of *the Rainbow*. I think you will find, too, that we have greatly increased the utility of the magazine, added many features and, in general, made it a better magazine to read and use. All that costs money. And quite a bit of it, too.

Our postage bill for U.S. subscriptions alone has increased by more than our *entire* printing bill for the first year we were in operation! A year ago we had one graphic designer to lay out the magazine — today there are four on the staff. Too, we had one editorial person besides myself. Now there are eight. We do our own typesetting: A year ago I did most of it, along with one part-time secretary. Now, three people work almost full-time at the job.

I don't even want to talk printing costs, but suffice it to say that we get calls weekly from printers all across the country asking us whether they can have our business. What we pay our printer for this issue alone will be more than double what we paid for all our printing in 1982!

In short, I don't believe it is wrong for us to be asking for this $6 per year subscription rate increase. And, although we will be charging the additional $6 after the first of the year, it will not affect your subscription rate, anyway, if you sign up for another year before January 1.

Even though it does not affect you, I hope you can be understanding of the reasons for this increase. From the very first issue of *the Rainbow*, all we wanted to do was bring you the best information possible about the Color Computer. We still want to do that and I hope you will agree with us that we do.

And now the good news . . .

We have a couple of really interesting things up our sleeves for 1984. As longtime readers of *the Rainbow* know, we don't like to talk much about things we are going to do until we are actually in the position of announcing them, but at this time things look so favorable that we're willing to give you a few hints as to what they might be.

One of them is a new feature, one that will have, we believe, a profound effect on the way young children "meet" and use a computer. As you can see from our pages, we have always been "into" education — with a number of columns and articles (and a special yearly issue) on the subject. But, we realize that you can easily "divide" education into two categories — the formal in-school setting and the less formal at-home setting.

I think we have made some excellent penetration into the more formal uses of the CoCo in the educational process. Columns by Dr. Michael Plog and Steve Blyn have helped in this area, along with a

(Continued on page 88)

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The standard Color Computer display of 32 characters by 16 lines without lower case is simply inadequate for serious word processing. The checkerboard letters and tiny lines give you no feel for how your writing looks or reads. Telewriter gives the Color Computer a 51 column by 24 line screen display with *true lower case characters*. So a Telewriter screen looks like a printed page, with a good chunk of text on screen at one time. In fact, more on screen text than you'd get with Apple II, Atari, TI, Vic or TRS-80 Model III.

On top of that, the sophisticated Telewriter full-screen editor is so simple to use, it makes writing fun. With single-letter mnemonic commands, and menu-driven I/O and formatting, Telewriter surpasses all others for user friendliness and pure power.

Telewriter's chain printing feature means that the size of your text is never limited by the amount of memory you have, and Telewriter's advanced cassette handler gives you a powerful word processor without the major additional cost of a disk.

...one of the best programs for the Color Computer I have seen...
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64 COLUMNS (AND 85!)

Besides the original 51 column screen, Telewriter-64 now gives you 2 additional high-density displays: 64 × 24 and 85 × 24!! Both high density modes provide all the standard Telewriter editing capabilities, and you can switch instantly to any of the 3 formats with a single control key command.

The 51 × 24 display is clear and crisp on the screen. The two high density modes are more crowded and less easily readable, but they are perfect for showing you the exact layout of your printed page, *all on the screen at on time*. Compare this with cumbersome "windows" that show you only fragments at a time and don't even allow editing.

RIGHT JUSTIFICATION & HYPHENATION

One outstanding advantage of the full-width screen display is that you can now set the screen width to match the width of your printed page, so that "what you see is what you get." This makes exact alignment of columns possible and it makes hyphenation simple.

Since short lines are the reason for the large spaces often found in standard right justified text, and since hyphenation is the most effective way to eliminate short lines, Telewriter-64 can now promise you some of the best looking right justification you can get on the Color Computer.

FEATURES & SPECIFICATIONS:

Printing and formatting: Drives any printer (LPVII/VIII, DMP-100/200, Epson, Okidata, Centronics, NEC, C. Itoh, Smith-Corona, Terminet, etc).

Embedded control codes give full dynamic access to intelligent printer features like: underlining, subscript, superscript, variable font and type size, dot-graphics, etc.

Dynamic (embedded) format controls for: top, bottom, and left margins; line length, lines per page, line spacing, new page, change page numbering, conditional new page, enable/disable justification.

Menu-driven control of these parameters, as well as: pause at page bottom, page numbering, baud rate (so you can run your printer at top speed), and Epson font. "Typewriter" feature sends typed lines directly to your printer, and Direct mode sends control codes right from the keyboard. Special Epson driver simplifies use with MX-80.

Supports single and multi-line headers and automatic centering. Print or save all or any section of the text buffer. Chain print any number of files from cassette or disk.

File and I/O Features: ASCII format files — create and edit BASIC, Assembly, Pascal, and C programs. Smart Terminal files (for uploading or downloading), even text files from other word processors. Compatible with spelling checkers (like Spell 'n Fix).

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BUILDING DECEMBER'S RAINBOW

Our Holiday Issue . . .
The Year's End Edition . . .
Paging Through The Wish Book . . .

As each holiday season comes along, I vow that this year I'll shop early. This year, I won't grab something at the last minute. This year will be different.

Years ago, as a small town boy, I did shop early — when the spring, summer, fall and winter Sears catalogs came. And, all my thoughts were updated when the Christmas catalog arrived. My grandmother called it the "wish book," which I thought was so old-fashioned, but the wish book magic was not lost on me. I spent hours "window shopping" the Sears catalog — and not just the toy section. I remember one year that, more than anything, I wanted a power winch to hook to the front bumper of a Jeep. It made no difference that nobody in my family owned a Jeep. By year's end, I had become a little more reasonable in my expectations, but those were magic times when I scanned the mail order catalog and daydreamed about all I could do if only I had a . . .

Nowadays, I help produce a wish book of sorts, *the Rainbow*, and in a very real sense I envy those of you who get to receive it in the mail. May I wish you a stocking full of software and a disk drive or printer under every tree.

Our holiday package for you is chock full of CoCo Christmas carols, CoCo greeting cards, an addressing program, a Christmas letter generator and even Stephanie and Bill Snyder's CoCo version of the traditional Hanukkah game of Dreidl, which is enjoyed by children and adults alike.

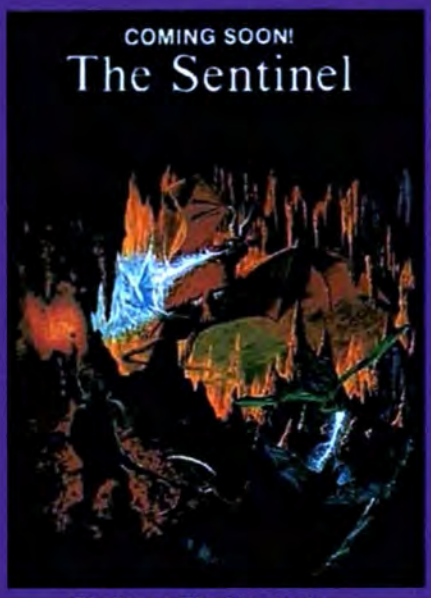
If Santa brought you a disk drive last year, this holiday season we have a special treat — a bagful of disk utilities designed to bring order and organization to your disk files. To begin with, we have another disk feature by Roger Schrag, in which he shows you how to back up your disks in a third the usual time, with greater flexibility and more options, and even how to revive those crashed diskettes. In addition to two disk utilities Kevin Davidson offers to help demystify ML programs stored on disk, other *Rainbow* writers have produced a trio of short programs: to alphabetize your directory file; to list up to 30 files on the screen of *DIR* and then run any of them by keying in only the selection number; and, finally, a sort of directory of directories, which produces an alphabetized listing of up to 10 disk directories in a single printout. So, start the new year off right by organizing those disk files.

Bob Russell is back to wind up his year of discovery, uncovery and documentation in cataloging additional RAM and ROM areas for his Color Computer Memory Map. He has lots of new goodies for graphics (circle and line definitions in RAM) and music lovers should note the RAM storage areas for the *PLAY* command. Disk users should examine all the disk RAM and ROM documentation. Finally, it looks like Bob has a good head start documenting differences between all the ROMs.

As always, December's *Rainbow* — like the Sears catalog — has something for everybody. Remember, though, if *Rainbow* has become one of your wish books, too, be sure to let Santa know what's on your list in plenty of time to ensure timely delivery of your holiday gift selections. And, while you're at it, a gift subscription of our wish book is still only $22 for a 4,000-plus page full-year's installment. Then, your friends can shop early, in fact, all year 'round.

—Jim Reed

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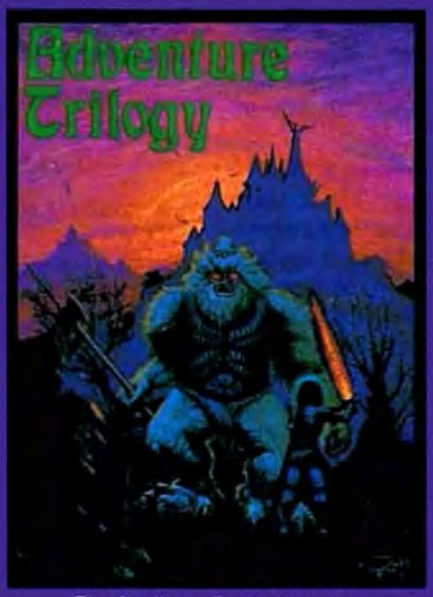
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Turn Your Printer Into A Typesetter

With



By Michael J. Himowitz

Not long after I got a new printer, I became fascinated with the idea of using it as a typesetter — with my own typefaces. I also wanted a utility that would create unusual and eye-catching title pages without a hassle. The result is *Bigprint*, which is designed for a 16K Color Computer with Extended BASIC but will run — with a few minor modifications — on any computer with similar BASIC string manipulation commands.

Bigprint creates lines of block characters in an 8" by 11" grid and centers them horizontally on the page. The character set includes the 26 letters of the alphabet and the numbers 0 through 9. The program will also allow the block character lines to be interspersed with lines of normal-sized type (10 CPI), which will also be centered. The block characters can be made up of any ASCII character your printer will handle.

In its default mode, designed for the LP VII and DMP-100 (which do not have condensed type), *Bigprint* will print six block characters to a line on an 80-column printer and 10-characters on a 132-column printer. If you have a printer such as the Epson or Gemini with condensed type, boldface, double-strike, block graphics and linefeed length control, *Bigprint* offers unlimited possibilities with up to 10 characters per line on an 80-column printer. With the right commands, it can even create a reasonable facsimile of 72 point headline type.

(Michael Himowitz is a Washington correspondent for the Baltimore Evening Sun and proprietor of Federal Hill Software. He uses his computer extensively and has written several programs including "CoCo Accountant." He is interested in meeting people who use their computers in journalism.)

Here's how it works:

If you have a 16K machine, enter a *PCLEAR1* command before running the program. This is not necessary with a 32K computer. When *Bigprint* boots up, you will see a menu with these three choices:

A) SET PRINTER COMMANDS
B) ENTER "BIGPRINT" MESSAGE
C) SET BLOCK CHARACTER

If you have a DMP-100 or LP VII printer, use options "B" or "C." The printer commands in "A" won't be of any help to you. If your printer will accept these commands, use "A" first if you want a typeface that is different from the default.

A) Set Printer Commands

If you have a printer with the enhancements mentioned above (some or all are available on the Epson, Gemini, C. Itoh, and Okidata, as well as on the Radio Shack DMP-200 and equivalent printers), you have a vast variety of options. There are two different sets of printer commands, one for the lines of *Bigprint* type and one for lines of standard 10-CPI type.

They will allow you to enter a string of up to 20 ASCII control and escape codes, one at a time. Each ASCII number must be followed by an [ENTER]. For those who have used the *Telewriter* word processor, the format is similar to the DIRECT command entry on the format menu.

When you're through with your command string, hit the [ENTER] key with no other input. The program will then print out the command string on the screen in the form CHR$(X) CHR$(Y), etc. It will ask if the string is correct. If

it is, [ENTER] "Y" and the string will be sent directly to the printer (make sure it's on line). If it is not correct, [ENTER] "N" and you will be prompted for the entire string again.

Always make the first command(s) in the string the codes that return the printer to its normal printing state (10 CPI). This will nullify any previous commands and prevent nasty surprises. On the Epson or Gemini (which I use), the return to normal printing means entering a 27 followed by a 64. This is the equivalent of an ESC "@." Follow this with the commands you want for the actual printed line.

For example, to print in the condensed mode on the Epson or Gemini, enter a 15. This is necessary to get 10 *Bigprint* characters per line on an 80-column printer. For double strike, [ENTER] a 27 followed by a 71. To set the Gemini linefeed to 7/72 of an inch, which creates nice, dense letters with condensed type, enter a 27 and a 49. On some printers, you can use a series of codes to set linefeeds to a tiny fraction of an inch, which will give you even denser (albeit somewhat squashed) lettering. For other printers, consult your manual to determine the appropriate ASCII codes. It's a lot of fun to experiment.

B) Enter *Bigprint* Lines

When you choose this option, there will be a slight delay while the character-building strings are read into memory. Then the program will ask whether you want six or 10 characters per line. Enter the appropriate number, but remember that you need condensed type to get 10 characters per line with an 80-column printer.

Having taken care of this housekeeping, you are ready to enter the *Bigprint* text. For each line, the program will ask you to enter either "B" for a *Bigprint* line or "S" for standard sized type. Once you have done this, you may enter the line itself. You will then be prompted for the next line. The program will accept up to 10 lines of type. When you've completed your message, hit the [ENTER] key with no other input when prompted for the line type size. Your message will then be displayed line by line, along with an "S" for standard type or "B" for *Bigprint*.

To print the message, position the paper roughly according to the number of lines you have. It was impossible to program this function because the length of linefeeds will vary. You'll have to do a little estimating. Once the paper is in position, hit the [ENTER] key and watch the program hum. Experiment to get the feel of it.

C) Set *Bigprint* Character

The default character that makes up the *Bigprint* blocks is an "X." You can change this to any character your printer will accept by entering the proper ASCII code for that character. Check your printer manual for a list of codes and their respective characters. For example, if you want to change the block character to a "%," [ENTER]37. For a "Z," [ENTER]90.

This function will also allow you to use block graphics characters if they are available on your printer. For example, to get dense, black headline-style type on my Gemini, I used the solid black full-space block ASCII (239), set the linefeed to 10/144 of an inch and used the condensed type face with double strike.

I had a lot of fun fooling around with various character combinations, and here are a few guidelines. *M*s and *W*s

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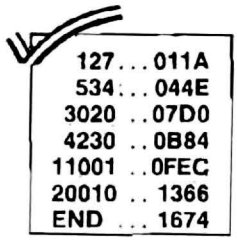
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produce darker characters, while "+" signs, slashes and *I*s produce more delicate type. You can get a very good bold effect by using an asterisk (*) with a combination double strike and emphasized mode, while some of the graphic block characters produced type that seemed to jump right off the page.

On some printers, you may run into a little problem centering in the condensed type mode. This happens because condensed type is not standardized. On my mini, it's 17 characters per inch, but other printers use 15, 16 or 18 CPI. You can alter this by changing line 530. The number 128 in that line represents the number of columns on 8½" paper in the 17-CPI mode. By adjusting this number up or down you can move the centering in the appropriate direction.

A word about conversions. If you would like to run this program on another computer, it requires only a few changes. First, change all the *PRINT#-2*, commands to *LPRINTs*. And get rid of the fancy graphics at the start by deleting Line 25 and Lines 20000 through 20360. You might want to do this on your Color Computer anyway, since they're gratuitous. I just happened to like them. Some computers may not require the CLEAR 4400 in Line 20. Also, for the block character replacement function to work, the computer's BASIC must allow the *MID$(A$,X,Y)* command to be used to replace one substring with another. Finally, the computer must accept the *STRING$* command.



The listing:

```
10 REM BIGPRINT
11 REM (C) 1983 BY MICHAEL J. HI
MOWITZ
20 CLEAR 4400
25 GOSUB 20000
30 DIM G$(41), L(40,8), J$(15),
M(15), TF$(10), RW(20), RX(20)
33 BE=88
35 GOSUB 5000
40 CLS:PRINT"ONE MOMENT PLEASE..
..":FOR X=1 TO 41:READ G$(X)
45 IF BE<>88 THEN GOSUB 3000
50 NEXT X
90 FOR X=1 TO 36
100 FOR Y=1 TO 8
110 READ L(X,Y)
120 NEXT Y
125 NEXT X
126 RESTORE
127 GOSUB 1000
200 CLS:PRINT:PRINT"          b
igprint":PRINT
210 PRINT"YOU MAY INPUT UP TO 15
 LINES":PRINT"WITH UP TO"NC "LET
TERS EACH"
220 PRINT:PRINT "TO BEGIN,";INPU
T"PRESS enter";PE
230 CLS:FOR J=1 TO 15
240 PRINT "LINE NO. "J:INPUT"(s)
TANDARD OR (b)IGPRINT";TF$(J):GO
SUB 4400:IF TF$(J)="B" THEN PRIN
T" ("NC" CHRS MAX.)"
242 IF TF$(J)<>"B" AND TF$(J)<>"
S" THEN PRINT"'B' OR 'S', PLEASE
":SOUND 200,5:GOTO 240
243 LINE INPUT J$(J)
250 IF TF$(J)="B" AND LEN(J$(J))
> NC THEN SOUND 100,3:PRINT"LINE
 TOO LONG":PRINT"corrected":GOTO
 240
255 GOTO 390
260 LL=LEN(J$(J)):VB=NC-LL:VC=IN
T(VB/2)+1:J$(J)=STRING$(VC,32)+J
$(J)
390 NEXT J:GOTO 500
400 J=J-1:GOTO 500
500 CLS:PRINT"YOUR MESSAGE:":FOR
 K=1 TO J:PRINT TF$(K)+">"+J$(K)
:NEXT:PRINT:PRINT"POSITION TOP O
F PAPER":PRINT"AT PRINTER HEAD":
INPUT "AND PRESS enter";PE
520 FOR K=1 TO J
523 IF TF$(K)="S" THEN GOSUB 200
0:GOTO 650
525 FOR Y=1 TO 8
527 LL=LEN(J$(K)):TL=LEN(J$(K))*
13
530 IF NC=10 THEN TL=INT((128-TL
)/2) ELSE IF NC=6 THEN TL=INT((7
8-TL)/2)
535 PRINT#-2,STRING$(TL,32);
550 FOR V=1 TO LEN(J$(K))
555 IF MID$(J$(K),V,1)="0" THEN
MID$(J$(K),V,1)="O"
560 Z$(V)=MID$(J$(K),V,1)
561 IF V>LEN(J$(K)) THEN 640
562 M(V)=ASC(Z$(V))-64
565 IF M(V)=-32 THEN M(V)=27:GOT
O 600
570 IF M(V)<-6 AND M(V)>-16 THEN
 M(V)=M(V)+43
600 PRINT#-2,G$(L(M(V),Y))+"  ";
610 NEXT V
620 PRINT#-2
630 NEXT Y
640 PRINT#-2:PRINT#-2
650 NEXT K
660 GOTO 5000
1000 CLS:PRINT:PRINT"          b
igprint":PRINT
1010 PRINT"HOW MANY CHARACTERS P
ER LINE?"
1020 PRINT:PRINT"6 CHARACTERS (S
TANDARD 10 CPI)":PRINT"10 CHARAC
TERS (NEEDS CONDENSED":PRINT"FON
T OR 132-COL PRINTER)":PRINT:INP
UT"YOUR CHOICE (6 OR 10)?";NC
1040 IF NC<>6 AND NC<>10 THEN 10
```

```
00
1080 RETURN
2000 IF TF$(K-1)="S" THEN PRINT#
-2
2010 IF TF$(K-1)="B" THEN FOR U=
1 TO 2:PRINT#-2:NEXT U
2020 LL=LEN(J$(K))
2030 TL=INT((76-LL)/2)
2045 FOR E=1 TO NP-1:PRINT#-2,CH
R$(RX(E));:NEXT E:PRINT#-2,STRIN
G$(TL,32)+J$(K)
2050 IF TF$(K+1)="S" THEN PRINT#
-2
2060 IF TF$(K+1)="B" THEN FOR D=
1 TO CM-1:PRINT#-2,CHR$(RW(D));:
NEXT D:FOR U=1 TO 3:PRINT#-2:NEX
T U
2070 RETURN
3000 FOR U=1 TO LEN(G$(X))
3010 IF MID$(G$(X),U,1)="X" THEN
 MID$(G$(X),U,1)=CHR$(BE)
3020 NEXT U:RETURN
4000 CLS:PRINT"YOU MAY ENTER UP
TO 20 DIRECT    PRINTER COMMANDS.
 THEY SHOULD    BE IN THE FORM OF
 ASCII CONTROL OR ESCAPE CODES.
TO END THE      STRING OF COMMAND
S, HIT enter    WITH NO OTHER INP
UT."
4010 PRINT"DO YOU WANT TO ENTER
THESE":INPUT"PRINTER COMMANDS (Y
/N)";PC$
4020 IF PC$<>"Y" THEN 5000
4030 CLS:CM=1
4040 PRINT"COMMAND NO. "+STR$(CM
)+":";:INPUT RW(CM):IF RW(CM)=0
THEN 4100
4050 CM=CM+1
4060 GOTO 4040
4100 CLS:PRINT"HERE IS THE STRIN
G OF COMMANDS  YOU HAVE JUST ENT
ERED":PRINT
4110 FOR D=1 TO CM-1:PRINT"CHR$(
"+STR$(RW(D))+") ";:NEXT D
4120 PRINT:INPUT "IS THIS CORREC
T (Y/N)";CR$:IF CR$<>"Y" THEN PR
INT "corrected": GOTO 4030
4130 FOR D=1 TO CM-1:PRINT#-2,CH
R$(RW(D));:NEXT D:PRINT#-2
4140 CLS:PRINT"INPUT THE COMMAND
S THAT RESTORE ";:PRINT"NORMAL P
RINTING.":PRINT"HIT enter WHEN F
INISHED"
4150 NP=1
4160 PRINT"COMMAND NO."NP":";:IN
PUT RX(NP):IF RX(NP)=0 THEN 4200
4170 NP=NP+1:GOTO 4160
4200 CLS:PRINT"THESE ARE THE COM
MANDS TO        RESTORE NORMAL PR
INTING"
4210 FOR E=1 TO NP-1:PRINT"CHR$(
"RX(E)")";:NEXT E
4220 PRINT:INPUT "IS THIS CORREC
T (Y/N)";CR$:IF CR$="Y" THEN 500
0
4230 PRINT"corrected":GOTO 4150
4300 CLS:PRINT"THE DEFAULT CHARA
CTER FOR        LETTER BLOCKS IS
'X', WHICH IS   ASCII (88). DO YO
U WISH TO       SUBSTITUTE ANOTHE
R CHARACTER?    (Y/N)?"
4310 INPUT YD$:IF YD$<>"Y" THEN
BE=88:GOTO 4330
4320 INPUT"ENTER THE ASCII CODE
FOR THE     CHARACTER YOU WANT";B
E
4330 GOTO 5000
4400 IF TF$(J)="" THEN 400 ELSE
RETURN
5000 CLS:PRINT"                BIGPRIN
T":PRINT"
5010 PRINT"A. SET PRINTER COMMAN
DS":PRINT"B. ENTER 'BIGPRINT' ME
SSAGE":PRINT"C. SET BLOCK CHARAC
TER"
5020 CH$=INKEY$:IF CH$="" THEN 5
020
5030 ON INSTR("ABC",CH$) GOTO 50
60, 40, 4300
5040 GOTO 5000
```


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```
5060 GOSUB 4000:GOTO 5000
10001 DATA "XXX      XXX",XXXXXXX
XXXX,"XXXXXXX     "," XXXXXXXXX "
,"XXXXXXXXXX "
10006 DATA XXX    XXXXX,"     XXX
   ",XXX  XX XXX,"XXX     XXX ","
XXX  XXX    "
10011 DATA "XXX    XXX  ",XXX
XXXX,XXXX    XXXX,XXX XXX XXX,XXX
  X  XXX
10016 DATA XXXX     XXX,XXXXX    X
XX,XXX     XXXX,XXX    XXXXX," XXX
XXXX  X"
10021 DATA " XXX    XXX ","  XXX
XXX  ","    XXXXX    ","      X
 ","  XXXXXXX  "
10026 DATA "      XXXXXX ", "  XX
XX      ", "    XXX      ", " XXXX
     ", "     XXXX    "
10031 DATA "  XXXXX     ","     XX
XXXX ","     XXXXXXX","         XX
X","XXX          "," XXXXXXXXXX"
10036 DATA  "              ", "    X
XXX     ", "XXXXXXXXX  ","  XXXXX
    ", " XXXXXXXXXX"
11001 DATA 4,2,1,1,2,2,1,1
11002 DATA 5,2,1,5,2,1,2,5
11003 DATA 4,2,35,35,35,35,2,4
11004 DATA 5,2,1,1,1,1,2,5
11005 DATA 2,2,35,3,3,35,2,2
11006 DATA 2,2,35,3,3,35,35,35
11007 DATA 36,2,35,6,6,1,2,36
11008 DATA 1,1,1,2,2,1,1,1
11009 DATA 7,7,7,7,7,7,7,7
11010 DATA 34,34,34,34,1,1,2,4
11011 DATA 9,11,10,3,3,10,11,12
11012 DATA 35,35,35,35,35,35,2,2
11013 DATA 1,13,2,14,15,1,1,1
11014 DATA 1,16,17,14,19,18,1,1
11015 DATA 4,2,1,1,1,1,2,4
11016 DATA 5,2,1,2,5,35,35,35
11017 DATA 4,2,1,1,8,1,5,20
11018 DATA 5,2,1,5,2,1,1,1
11019 DATA 36,2,35,5,36,34,2,5
11020 DATA 2,2,7,7,7,7,7,7
11021 DATA 1,1,1,1,1,1,2,4
11022 DATA 1,1,1,21,22,23,7,24
11023 DATA 1,1,1,15,14,2,1,1
```


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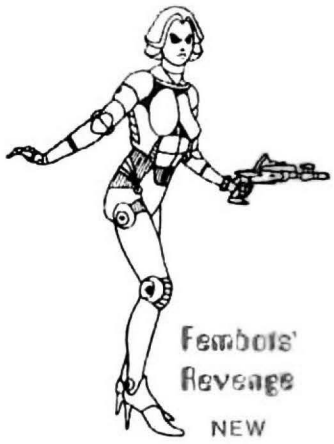
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```
11024 DATA 1,1,21,23,25,21,1,1
11025 DATA 1,21,22,23,7,7,7,7
11026 DATA 2,2,32,30,27,29,2,2
11027 DATA 37,37,37,37,37,37,37,
37
11028 DATA 38,40,7,7,7,7,7,7
11029 DATA 5,2,34,4,39,35,2,2
11030 DATA 5,2,34,32,33,34,2,5
11031 DATA 1,1,1,2,2,34,34,34
11032 DATA 2,2,35,5,2,34,2,5
11033 DATA 35,35,35,5,2,1,2,4
11034 DATA 2,2,34,34,34,34,34,34
11035 DATA 4,2,1,4,2,1,2,4
11036 DATA 4,2,1,2,41,34,2,4
20000 REM SCREEN
20010 GOSUB 20260
20020 T=0
20030 GOSUB 20310
20040 GOSUB 20260
20050 A1$=STRING$(30,223)
20060 A2$=STRING$(28,223)
20070 CLS0
20080 PRINT@481,A1$;:PRINT@481-3
1,A2$;
20090 PRINT@418,STRING$(28,211);
20100 A3$=CHR$(223)+STRING$(26,2
20)+CHR$(223)
20110 PRINT@386,A3$;
20120 FOR X=1 TO 400:NEXT
20130 A4$=STRING$(24,207)
20140 FOR J=1 TO 500:NEXT J
20150 Z=388
20160 FOR Y=Z TO Z-388 STEP -32
20170 PRINT@Y, A4$;:GOSUB 20290
20180 NEXT Y
20190 L=75:GOSUB 20280
20200 FOR J=1 TO 150:NEXT J
20210 P$=C$:L=134:GOSUB 20280
20230 P$=H$:L=266:GOSUB 20280
20240 P$=BG$:L=331:GOSUB 20280
20250 IF INKEY$="" THEN 20250
20251 RETURN
20255 GOTO 23
20260 P$="bigprint"
20270 RETURN
20280 FOR K=1 TO LEN(P$):PRINT@L
,LEFT$(P$,K);:GOSUB 20290:FOR X=
1 TO 20:NEXT X:NEXT K:RETURN
20290 PLAY "V15;T255;L8;C;B;A;G;
D"
20300 RETURN
20310 M2$=STRING$(5,207)+P$+STRI
NG$(8,207)
20320 C$="by"+CHR$(128)+"michael
"+CHR$(128)+"himowitz"
20340 H$="hit"+CHR$(207)+"any"+C
HR$(207)+"key"
20350 BG$="to"+CHR$(207)+"begin"
20360 RETURN
```

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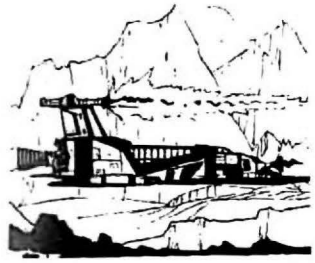
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Your ship is being enshrouded by the Xygoid Web. Certain death is minutes away! You must blast through the enveloping Web and destroy the Xygoid vessel before you are crushed. This is a multi-colored machine-code game in the highest resolution mode on a black background. Xygoid, from the galactic beginning! It will ensnare your mind!

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The King of Pac games is here. This fast-paced maze-chase game will challenge the most skilled. You guide The Nibbler through the maze, the portals, onward to the Energy Pills. Then the Ghouls, constantly at your heels, will end up in your belly! The better you get the better you have to become to master the blazing speed. You haven't pushed your skill until you've tried this one!

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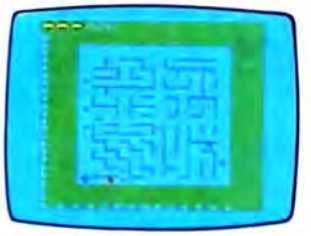
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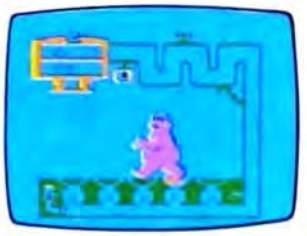
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A More Powerful Disk Backup Utility



By Roger Schrag

Do you have any diskettes which contain important information, but you can't back them up because *BACKUP* gives you an I/O error? Do you have partially crashed diskettes which can't be salvaged because of I/O errors? Does it bother you that it takes over four and a half minutes to backup a diskette with *VERIFY ON*? Finally, when you have a whole bunch of copies to make, do you consider it a hassle to have to continuously retype the *DSKINI* and *BACKUP* commands?

If you answered "yes" to any of these questions, then I have a program for you. It is called the *Disk Backup Utility*. The utility does essentially the same thing that *BACKUP* does, but in less than one-third the time, and with greater flexibility and more options.

The source code shown in the listing may be entered using any Editor Assembler that supports disk drives. There are two versions of Disk Extended Color BASIC currently in use: 1.0 and 1.1. There are differences between the two versions which affect this program. The symbol VER is used in the source code to take care of these differences, making the program compatible with all Color Computer disk systems.

(Roger Schrag, currently studying computer science at the University of California at Berkeley, enjoys working with CoCo and writing articles for ***the Rainbow****. He also designs and translates programs for Adventure International.)*

To use the utility, simply *LOADM* the assembled program and *EXEC* it. A title screen will appear, and you will be asked for the source and destination drive numbers. Press a numbered key from zero to three. You don't need to press [ENTER]. You may use only one drive with *Disk Backup Utility* if you wish; you will be prompted to swap diskettes when necessary. If you are using two drives, then you must have the diskettes in the drives all ready to go *before* you type in the drive numbers.

The utility starts out by initializing the destination diskette. This saves you the bother of having to use *DSKINI* first. You may find this handy if you have a whole batch of copies to make; the utility does everything in one step. If your diskette was already initialized, no harm is done. An on-screen display keeps you informed as things take place.

Next, the utility reads data from the source diskette, five tracks at a time, and copies it onto the destination diskette. The on-screen display continues to keep you up to date on exactly what is taking place. After a track is written onto the destination diskette, it is immediately read back and verified. If there are any discrepancies, you are given the flawed track's number and the function is canceled (terminated).

After five tracks are written out and verified, the utility goes back to the source diskette and reads the next five tracks. This goes back and forth seven times to complete the whole diskette. If the utility has trouble reading a sector from the source diskette, it will automatically try to read the sector four more times, just like *BACKUP*.

But here is where *Disk Backup Utility* really shines. If *BACKUP* is still unable to read the sector after the four additional tries, it gives up with an I/O error. The utility, instead, gives you a menu with three options. Press a numbered key from one to three to choose how the error should be dealt with.

Your first option is to try the bad sector four more times. If the utility is able to read the sector successfully, the message "Got it!" appears and the procedure continues normally. If, however, the utility is still unable to read the sector, you are returned to the menu.

Your second option is to perform an "infinite retry." This is where the utility continuously tries and tries again to read the bad sector, hoping that eventually it will get it. This tactic often works, but is by no means a guarantee. You may hold down any key to stop the infinite retry and return to the menu. However, *Disk Backup Utility* only checks the keyboard after every fourth try, so you may need to hold the key down for several seconds before you are actually returned to the menu.

> "*[Disk Backup Utility . . .]* does essentially the same thing as *BACKUP* does, but in less than one-third the time, and with greater flexibility and more options."

Your final option is to skip the bad sector altogether. The procedure will then continue as normal. The corresponding sector on the destination diskette will be left black (filled with $FFs). By using this option, you may retrieve as much information as physically possible from the damaged diskette. Since the utility provides you with the exact track and sector numbers of all bad sectors, you may wish to examine the destination diskette with a zap utility in order to reconstruct the data that was in the sector that had to be skipped.

Disk Backup Utility will only cancel the entire function if the destination diskette is write-protected, or somehow flawed or damaged. If the function is canceled, you will be provided with an error message explaining the problem.

Whether the function is canceled or completed successfully, you will be prompted to press [ENTER] to start the whole program over again. This makes it convenient for producing a large number of copies. If you wish to return to BASIC, simply press [RESET]. Any program that was in memory, however, will be lost.

The program listing is rather long, so I am offering the source code and assembled program on diskette for $7 for those who don't want to type. You also may want to purchase the diskette if you want the utility but don't yet own an Editor Assembler. My address appears at the top of the program listing.

The utility uses the DSKCON routine to load, write, and verify sectors. This is the one disk-related routine that is documented by Radio Shack, and it is discussed in the Disk System manual on Pages 60 and 61. Because Radio Shack went to the trouble to explain how this routine works, they made sure that it would still work in exactly the same way with their newer version of Disk Extended Color BASIC, version 1.1.

Unfortunately, the three undocumented routines used for initializing the destination diskette *don't* work the same on the new version of Disk Extended Color BASIC. This explains the need for the VER symbol in the program listing. If you are in doubt as to which version your machine has, the number appears on the screen every time you turn on your computer with the disk cartridge in place.

Disk Backup Utility works at a time savings of 70 percent over *BACKUP* with *VERIFY ON*, 40 percent with *VERIFY OFF*. The comments in the listing try to explain how this extra speed is attained.

Now, with the aid of the *Disk Backup Utility*, you may drag out those crashed diskettes that you long ago gave up for dead, and revive some valuable programs and data. Good luck!

The listing:

```
                    00001 ************************
                    00002 * DISK BACKUP UTILITY *
                    00003 ************************
                    00004 *
                    00005 *By:
                    00006 *   Roger Schrag
                    00007 *   2054 Manning Avenue
                    00008 *   Los Angeles, CA 90025
                    00009 *
                    00010 *
          0000      00011 VER     EQU     $0      ROM version
                    00012 *If you have Disk Extended Basic 1.1 change
                    00013 *the above line to: VER EQU $1
                    00014 *
1000                00015         ORG     $1000   Low area of memory
                    00016 *One sector buffer used for verifying data
                    00017 *On the destination diskette.
1000                00018 BUFFER  RMB     $100    256 bytes
                    00019 *Table of which sectors were read and which
                    00020 *Were skipped. One byte for each sector.
1100                00021 TABLE   RMB     $5A     90 bytes
                    00022 *These point to variables pertaining to the
                    00023 *DSKCON routine explained in the Disk System
                    00024 *Manual on page 60:
115A      0000      00025 DSKCMD  FDB     $0      Will point to DCOPC
115C      0000      00026 DRIVE   FDB     $0      Will point to DCDRV
115E      0000      00027 TRACK   FDB     $0      Will point to DCTRK
1160      0000      00028 SECTOR  FDB     $0      Will point to DCSEC
1162      0000      00029 DATA    FDB     $0      Will point to DCBPT
1164      0000      00030 STATUS  FDB     $0      Will point to DPSTA
                    00031 *Program variables:
1166      0000      00032 POINTR  FDB     $0      TABLE pointer
1168      0000      00033 MEMORY  FDB     $0      Memory pointer
116A      00        00034 SOURCE  FCB     $0      Source drive #
116B      00        00035 DEST    FCB     $0      Destination drive #
116C      00        00036 SWAP    FCB     $0      If user must swap disks
116D      00        00037 ORDER   FCB     $0      Order that sectors
116E      0105      00038         FDB     $0105   Should be read and
1170      090D      00039         FDB     $090D   Written from/to the
1172      1103      00040         FDB     $1103   The diskettes.
1174      070B      00041         FDB     $070B   This order makes the
1176      0F0C      00042         FDB     $0F0C   Procedure much faster
1178      1002      00043         FDB     $1002   Than BACKUP, which
117A      060A      00044         FDB     $060A   Reads and writes in
117C      0E12      00045         FDB     $0E12   Numerical order
117E      0408      00046         FDB     $0408   1,2,3,4...
1180      010C      00047 IORDER  FDB     $010C   The order in which
1182      0510      00048         FDB     $0510   Sectors should be
1184      0902      00049         FDB     $0902   Put on a diskette
1186      0D06      00050         FDB     $0D06   When initialized.
1188      110A      00051         FDB     $110A   This is the exact
```

```
118A    030E    00052          FDB    $030E   Order used by DSKINI
118C    0712    00053          FDB    $0712   (See page 59/60 of
118E    0B04    00054          FDB    $0B04    the manual for a
1190    0F08    00055          FDB    $0F08    chart.)
                00056 *
                00057 *Program execution begins here
1192 10CE 0F00  00058 START    LDS    #$0F00  Put stack out of way
1196 8E   0400  00059          LDX    #$400   Top of screen
1199 BD   1385  00060          JSR    CLS     Clear whole screen
119C 8E   1515  00061          LDX    #TITLE  Print a title msg
119F BD   1391  00062          JSR    PRINT   At top of screen
11A2 8E   152B  00063          LDX    #SRCDRV Source drive #
11A5 BD   13DD  00064          JSR    GETDRV  Get a drive number
11A8 B7   116A  00065          STA    SOURCE  Save source #
11AB 8E   1541  00066          LDX    #DSTDRV Destination drive #
11AE BD   13DD  00067          JSR    GETDRV  Get a drive number
11B1 B7   116B  00068          STA    DEST    Save destination #
11B4 B0   116A  00069          SUBA   SOURCE  If both are same,
11B7 B7   116C  00070          STA    SWAP    SWAP will equal zero
11BA 8E   C006  00071          LDX    #C006   Check the disk ROM
11BD 9F   115A  00072          STX    DSKCMD  Find the addresses
11C0 30   01    00073          LEAX   1,X     Of the various
11C2 9F   115C  00074          STX    DRIVE   Variables used by
11C5 30   01    00075          LEAX   1,X     The DSKCON routine.
11C7 9F   115E  00076          STX    TRACK   These variables are
11CA 30   01    00077          LEAX   1,X     Explained on page
11CC 9F   1160  00078          STX    SECTOR  60 of the manual.
11CF 30   01    00079          LEAX   1,X     :
11D1 9F   1162  00080          STX    DATA    :
11D4 30   02    00081          LEAX   2,X     :
11D6 9F   1164  00082          STX    STATUS  :
11D9 BD   13EF  00083          JSR    GETDST  Get destination disk
11DC BD   148C  00084          JSR    DSKINI  Initialize diskette
11DF 6F   9F 115E 00085        CLR    [TRACK] Start at track zero
                00086 *Master loop to copy five tracks at a time
11E3 A6   9F 115E 00087 LOAD   LDA    [TRACK] Check track number
11E7 81   23    00088          CMPA   #$23    Are we at track 35?
11E9 25   0F    00089          BLO    MORE    If not, more to do
11EB 8E   0520  00090          LDX    #$520   Clear bottom part
11EE BD   1385  00091          JSR    CLS     Of screen
11F1 8E   1654  00092          LDX    #DONE   Print completed
11F4 BD   1391  00093          JSR    PRINT   Message there
11F7 7E   14B0  00094          JMP    REDO    Go restart program
11FA BD   13E7  00095 MORE     JSR    GETSRC  Get source diskette
11FD 8E   04E0  00096          LDX    #$4E0   Clear bottom part
1200 BD   1385  00097          JSR    CLS     Of screen
1203 8E   1574  00098          LDX    #LMSG   Print loading track
1206 BD   1391  00099          JSR    PRINT   Message there
1209 8E   1100  00100          LDX    #TABLE  Set pointer to the
120C 9F   1166  00101          STX    POINTR  Beginning of TABLE
120F 8E   2000  00102          LDX    #$2000  Set aaa pointer to
1212 AF   9F 1162 00103        STX    [DATA]  Bottom of free aaa
1216 86   01    00104 LTRACK   LDA    #$1     Start with the
1218 A7   9F 1160 00105        STA    [SECTOR] First sector
121C 86   02    00106 READ     LDA    #$2     Tell DSKCON we want
121E A7   9F 115A 00107        STA    [DSKCMD] To read the sector
1222 BD   1418  00108          JSR    DSKCON  Use DSKCON routine
1225 26   27    00109          BNE    LERROR  Skip ahead if error
1227 6F   9F 1166 00110        CLR    [POINTR] Mark in TABLE that
                00111 *                       This sector was read
122B 8E   1166  00112 LSKIP    LDX    POINTR  Increment POINTR to
122E 30   01    00113          LEAX   1,X     Point to next byte
1230 9F   1166  00114          STX    POINTR  In TABLE. X=POINTR
1233 6C   9F 1162 00115        INC    [DATA]  Inc aemory pointer
1237 6C   9F 1160 00116        INC    [SECTOR] Inc sector number
                00117 *Five tracks is a total of 90 sectors. So
                00118 *when POINTR reaches TABLE+90, we have read
                00119 *enough for now, and are ready to write it
                00120 *all to the destination diskette.
123B BC   115A  00121          CMPX   #TABLE+$5A Are we done?
123E 27   7E    00122          BEQ    LOADED  Skip ahead if so
1240 A6   9F 1160 00123        LDA    [SECTOR] Get sector number
1244 81   13    00124          CMPA   #$13    Hit end of a track?
1246 25   D4    00125          BLO    READ    Loop back if not
1248 6C   9F 115E 00126        INC    [TRACK] Inc track number
124C 20   C8    00127          BRA    LTRACK  Go start new track
                00128 *Error encountered in loading a sector
124E 8E   0500  00129 LERROR   LDX    #$500   Clear bottom half
1251 BD   1385  00130          JSR    CLS     Of screen
1254 8E   159A  00131          LDX    #ERMSG  Print first half of
1257 BD   1391  00132          JSR    PRINT   An error aessage
125A A6   9F 1160 00133        LDA    [SECTOR] Get sector aumber
125E 8E   1160  00134          LDX    #ORDER  Adjust it, since we
1261 A6   86    00135          LDA    A,X     Read in scattered order
1263 BD   1441  00136          JSR    PRNUM   Print # of bad sector
1266 8E   15B7  00137          LDX    #ER2MSG Print second half of
1269 BD   1391  00138          JSR    PRINT   An error aessage
126C CC   3133  00139          LDD    #$3133  Wait for person to
126F BD   13A6  00140          JSR    GETKEY  Press 1, 2, or 3
1272 81   31    00141          CMPA   #$31    Want option #1?
1274 27   21    00142          BEQ    RETRY   Skip ahead if so
1276 81   33    00143          CMPA   #$33    How about option #3?
1278 27   35    00144          BEQ    SKIPIT  Skip ahead if so
127A 8E   1613  00145          LDX    #INFMSG Print aessage about
127D BD   1391  00146          JSR    PRINT   Infinite retry
1280 BD   1418  00147 INFINT  JSR    DSKCON  Try to read sector
1283 27   17    00148          BEQ    GOTIT   Skip ahead if got it
1285 AD   9F A000 00149        JSR    [$A000] Scan keyboard
1289 8E   0152  00150          LDX    #$152   Beginning of keys
128C 6C   80    00151 KCHECK   INC    ,X+     If person is holding
128E 26   BE    00152          BNE    LERROR  Any key, return to
1290 8C   015A  00153          CMPX   #$15A   The error aenu
1293 25   F7    00154          BLO    KCHECK  Otherwise, call on
1295 20   E9    00155          BRA    INFINT  DSKCON and try again
1297 BD   1418  00156 RETRY    JSR    DSKCON  Try to read sector once
129A 26   B2    00157          BNE    LERROR  Return to aenu if error
                00158 *A bad sector was successfully recovered
129C 8E   0500  00159 GOTIT    LDX    #$500   Erase error aenu
129F BD   1385  00160          JSR    CLS     From screen
12A2 8E   164B  00161          LDX    #GOTMSG Print Got it!
12A5 BD   1391  00162          JSR    PRINT   Message
12A8 6F   9F 1166 00163        CLR    [POINTR] The sector was read
12AC 7E   122B  00164          JMP    LSKIP   Go back to aain loop
12AF 86   FF    00165 SKIPIT   LDA    #$FF    Mark in TABLE that
12B1 A7   9F 1166 00166        STA    [POINTR] This sector was skipped
12B5 8E   0500  00167          LDX    #$500   Clear bottom half
12B8 BD   1385  00168          JSR    CLS     Of screen
12BB 7E   122B  00169          JMP    LSKIP   Go back to aain loop
                00170 *All five tracks have now been loaded
12BE BD   13EF  00171 LOADED   JSR    GETDST  Get destination disk
12C1 A6   9F 115E 00172        LDA    [TRACK] Move track aumber
12C5 B0   04    00173          SUBA   #$4     Back down, so we can
12C7 A7   9F 115E 00174        STA    [TRACK] Write proper tracks
12CB 8E   04E0  00175          LDX    #$4E0   Clear bottom part
12CE BD   1385  00176          JSR    CLS     Of screen
12D1 8E   1587  00177          LDX    #WMSG   Print writing track
12D4 BD   1391  00178          JSR    PRINT   Message there
12D7 8E   1100  00179          LDX    #TABLE  Set pointer to the
12DA 9F   1166  00180          STX    POINTR  Beginning of TABLE
12DD 8E   2000  00181          LDX    #$2000  Set aaa pointer to
12E0 AF   9F 1162 00182        STX    [DATA]  Bottom of free aaa
12E4 86   01    00183 WTRACK   LDA    #$1     Start with the
12E6 A7   9F 1160 00184        STA    [SECTOR] First sector
12EA 6D   9F 1166 00185 WRITE  TST    [POINTR] If sector was skipped
12EE 26   0D    00186          BNE    WSKIP   In load, skip it now
12F0 86   03    00187          LDA    #$3     Tell DSKCON we want
12F2 A7   9F 115A 00188        STA    [DSKCMD] To write the sector
12F6 BD   1418  00189          JSR    DSKCON  Use DSKCON routine
12F9 1026 016A  00190          LBNE   WERROR  Skip ahead if error
12FD 8E   1166  00191 WSKIP    LDX    POINTR  Increaent POINTR to
1300 30   01    00192          LEAX   1,X     Point to next byte
1302 9F   1166  00193          STX    POINTR  In TABLE. X=POINTR
1305 6C   9F 1162 00194        INC    [DATA]  Inc aemory pointer
1309 6C   9F 1160 00195        INC    [SECTOR] Inc sector number
130D A6   9F 1160 00196        LDA    [SECTOR] Get sector aumber
1311 81   13    00197          CMPA   #$13    Hit end of a track?
1313 25   D5    00198          BLO    WRITE   Loop back if not
1315 30   88 EE  00199          LEAX   -$12,X  Move POINTR back 18
1318 9F   1166  00200          STX    POINTR  Bytes (1 track)
131B AE   9F 1162 00201        LDX    [DATA]  Move aemory pointer
131F 30   89 EE00 00202        LEAX   -$1200,X Back a track also
1323 BF   1168  00203          STX    MEMORY  Save it in MEMORY
1326 8E   1000  00204          LDX    #BUFFER DSKCON will now load
1329 AF   9F 1162 00205        STX    [DATA]  Into BUFFER for verifying
                00206 *Verify the whole track
132D 86   01    00207          LDA    #$1     Start with the
132F A7   9F 1160 00208        STA    [SECTOR] First sector
1333 6D   9F 1166 00209 VERIFY TST    [POINTR] If sector was skipped
1337 26   20    00210          BNE    VSKIP   In load, skip it now
1339 86   02    00211          LDA    #$2     Tell DSKCON we want
```

```
133B A7   9F 115A  00212          STA   [DSKCMD] To read the sector
133F BD   1418     00213          JSR   DSKCON   Use DSKCON routine
1342 1026 0126     00214          LBNE  VERROR   Skip ahead if error
1346 8E   1000     00215          LDX   #BUFFER  X=from destination disk
1349 FE   1168     00216          LDU   MEMORY   U=from source disk
134C A6   80       00217 CHECK    LDA   ,X+      Get a byte from one
134E A1   C0       00218          CMPA  ,U+      Compare to the other
1350 1026 0118     00219          LBNE  VERROR   Skip ahead if error
1354 8C   1100     00220          CMPX  #BUFFER+$100 Loop back to
1357 25   F3       00221          BLO   CHECK    Check whole sector
1359 BE   1166     00222 VSKIP    LDX   POINTR   Increment POINTR to
135C 30   01       00223          LEAX  1,X      Point to next byte
135E BF   1166     00224          STX   POINTR   In TABLE. X=POINTR
1361 7C   1168     00225          INC   MEMORY   Inc memory pointer
1364 6C   9F 1160  00226          INC   [SECTOR] Inc sector number
1368 A6   9F 1160  00227          LDA   [SECTOR] Get sector number
136C 81   13       00228          CMPA  #$13     Hit end of a track?
136E 25   C3       00229          BLO   VERIFY   Loop back if not
1370 6C   9F 115E  00230          INC   [TRACK]  Inc track number
1374 FE   1168     00231          LDU   MEMORY   Move memory pointer
1377 EF   9F 1162  00232          STU   [DATA]   Back to DATA
137B 8C   115A     00233          CMPX  #TABLE+$5A Are we done?
137E 1025 FF62     00234          LBLO  NTRACK   Loop back if not
1382 7E   11E3     00235          JMP   LOAD     Go load next five tracks
                   00236 *
                   00237 *Various subroutines used by programs
1385 9F   88       00238 CLS      STX   $88      Set cursor position
1387 86   60       00239          LDA   #$60     $60=blank on screen
1389 A7   80       00240 CLEAR    STA   ,X+      Clear screen from
138B 8C   0600     00241          CMPX  #$0600   Wherever X was until
138E 25   F9       00242          BLO   CLEAR    The very bottom
1390 39            00243          RTS            Return
1391 A6   80       00244 PRINT    LDA   ,X+      Get a character
1393 27   51       00245          BEQ   RETURN   Return if end of msg
1395 8D   02       00246          BSR   VIDEO    Print the character
1397 20   F8       00247          BRA   PRINT    Loop back for more
1399 34   56       00248 VIDEO    PSHS  X,U,D    Save the registers
139B 0F   6F       00249          CLR   $6F      Device $0=screen
139D AD   9F A002  00250          JSR   [$A002]  Print character
13A1 35   D6       00251          PULS  D,U,X,PC Restore and return
13A3 CC   0D0D     00252 ENTER    LDD   #$0D0D   Wait for person to hit Enter
                   00253 *GETKEY waits for person to hit a key with
                   00254 *ASCII code in the range of values in the
                   00255 *A and B registers
13A6 34   06       00256 GETKEY   PSHS  D        Save the range
13A8 A6   9F 0088  00257 CURSOR   LDA   [$88]    What's at cursor?
13AC 8B   10       00258          ADDA  #$10     Blink cursor, making
13AE 8A   8F       00259          ORA   #$8F     Sure it's a graphic
13B0 A7   9F 0088  00260          STA   [$88]    Symbol. Show new cursor
13B4 8E   00C0     00261          LDX   #$00C0   Loop counter
13B7 30   1F       00262 KEY      LEAX  -1,X     Dec counter. Blink
13B9 27   ED       00263          BEQ   CURSOR   Cursor now and then
13BB AD   9F A000  00264          JSR   [$A000]  Scan keyboard
13BF A1   E4       00265          CMPA  ,S       Loop back if key was
13C1 25   F4       00266          BLO   KEY      Not in the desired
13C3 A1   61       00267          CMPA  1,S      Range
13C5 22   F0       00268          BHI   KEY      :
13C7 C6   60       00269          LDB   #$60     Erase the cursor
13C9 E7   9F 0088  00270          STB   [$88]    Character
13CD 32   62       00271          LEAS  2,S      Make up for PSHS D
13CF 81   0D       00272          CMPA  #$0D     Enter?
13D1 27   13       00273          BEQ   RETURN   Return if so
13D3 34   02       00274          PSHS  A        Save the key
13D5 8D   C2       00275          BSR   VIDEO    Print it on screen
13D7 86   0D       00276          LDA   #$0D     Drop cursor down to
13D9 8D   BE       00277          BSR   VIDEO    Next line on screen
13DB 35   82       00278          PULS  A,PC     Restore and return
13DD 8D   B2       00279 GETDRV   BSR   PRINT    Print prompt
13DF CC   3033     00280          LDD   #$3033   Wait for person to
13E2 8D   C2       00281          BSR   GETKEY   Press 0, 1, 2, or 3
13E4 80   30       00282          SUBA  #$30     Value from 0 to 3
13E6 39            00283 RETURN   RTS            Return
13E7 CE   16F7     00284 GETSRC   LDU   #SRCMSG  Insert source...
13EA B6   116A     00285          LDA   SOURCE   Source drive #
13ED 20   06       00286          BRA   GDRV1    Skip ahead
13EF CE   1720     00287 GETDST   LDU   #DSTMSG  Insert destination...
13F2 B6   116B     00288          LDA   DEST     Destination drive #
13F5 A7   9F 115C  00289 GDRV1    STA   [DRIVE]  Select drive number
13F9 8E   0500     00290          LDX   #$0500   Clear bottom half
13FC 8D   87       00291          BSR   CLS      Of screen
13FE 7D   116C     00292          TST   SWAP     Skip ahead if don't
1401 26   0F       00293          BNE   GDRV2    Need to swap disks
1403 7F   FF40     00294          CLR   $FF40    Make sure drive motor
1406 7F   0985     00295          CLR   $0985    Is off, and that ROM
1409 7F   0986     00296          CLR   $0986    Knows it is off
140C 1F   31       00297          TFR   U,X      Prompt person to
140E 8D   81       00298          BSR   PRINT    Insert proper diskette
1410 8D   91       00299          BSR   ENTER    Wait for Enter
1412 8E   04E0     00300 GDRV2    LDX   #$04E0   Clear bottom part
1415 7E   1385     00301          JMP   CLS      Of screen and return
                   00302 *DSKCON uses the ROM DSKCON routine. But it
                   00303 *also prints the track number on the screen
                   00304 *and modifies [SECTOR] so that the sectors
                   00305 *are read and written in a scattered order,
                   00306 *which goes much faster.
1418 8E   04F2     00307 DSKCON   LDX   #$04F2   Screen position
141B 9F   88       00308          STX   $88      For track number
141D A6   9F 115E  00309          LDA   [TRACK]  Get track number
1421 8D   1E       00310          BSR   PRNUM    Print it on screen
1423 A6   9F 1160  00311          LDA   [SECTOR] Get sector number
1427 34   02       00312          PSHS  A        Save the number
1429 8E   116D     00313          LDX   #ORDER   Adjust it, since we use
142C A6   84       00314          LDA   A,X      A scattered order instead
142E A7   9F 1160  00315          STA   [SECTOR] Save new sector #
1432 AD   9F C004  00316          JSR   [$C004]  Use ROM's DSKCON
1436 35   02       00317          PULS  A        Original sector #
1438 A7   9F 1160  00318          STA   [SECTOR] Put it back
143C A6   9F 1164  00319          LDA   [STATUS] Get error status
1440 39            00320          RTS            Return
                   00321 *Print value in A as a decimal number
1441 C6   2F       00322 PRNUM    LDB   #$2F     Prepare B for tens
1443 5C   00323 TENS   INCB                     Divide by ten, so
1444 80   0A       00324          SUBA  #$0A     That B ends up with
1446 2A   FB       00325          BPL   TENS     Tens digit, and A
1448 8B   3A       00326          ADDA  #$3A     With ones digit
144A 1E   89       00327          EXG   A,B      A=tens, B=ones
144C 81   30       00328          CMPA  #$30     Tens digit a zero?
```


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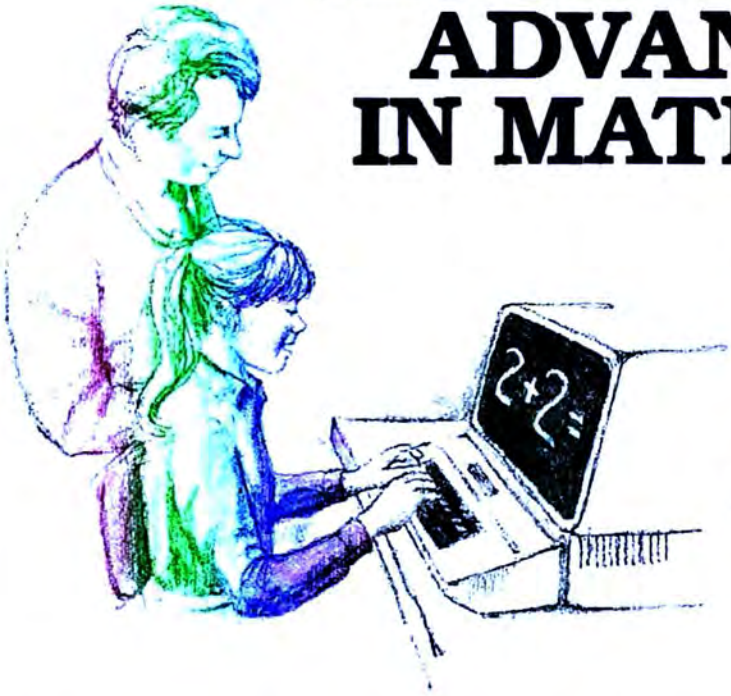
```
144E 26  04     00329          BNE    TWOD10  Skip ahead if not
1450 1E  89     00330          EXG    A,B     A now has ones
1452 C6  20     00331          LDB    #$20    B has a blank
1454 BD  1399   00332 TWOD10   JSR    VIDEO   Print tens digit
1457 1F  98     00333          TFR    B,A     Put ones in A
1459 7E  1399   00334          JMP    VIDEO   Print ones, return
                00335 *Handling of errors that terminate, abort,
                00336 *the whole procedure
145C CE  1666   00337 IERROR   LDU    #DRN981 Drive not ready
145F 4D         00338          TSTA           Was that the problem?
1460 2B  0D     00339          BMI    QUIT    Skip ahead if so
1462 CE  1677   00340          LDU    #DRN882 Otherwise must have
1465 20  08     00341          BRA    QUIT    Been write protect
1467 CE  1691   00342 WERROR   LDU    #DRN983 Write fault on
146A 20  03     00343          BRA    QUIT    Destination diskette
146C CE  16AC   00344 VERROR   LDU    #DRN984 Verification error
146F BE  0500   00345 QUIT     LDX    #$500   Clear bottom half
1472 BD  1385   00346          JSR    CLS     Of screen
1475 1F  31     00347          TFR    U,X     Print the proper
1477 BD  1391   00348          JSR    PRINT   Error message
147A BE  16BF   00349          LDX    #CANCEL Print Function
147D BD  1391   00350          JSR    PRINT   Cancelled message
1480 BE  16DB   00351 REDO     LDX    #AGAIN  Print press Enter to
1483 BD  1391   00352          JSR    PRINT   Start again
1486 BD  13A3   00353          JSR    ENTER   Wait for Enter
1489 7E  1192   00354          JMP    START   Start program again
                00355 *Initialize the destination diskette
148C BE  0700   00356 DSKINI   LDX    #$700   Write the order the
148F A6  89 0A80 00357 IN1     LDA    IORDER-$700,X Sectors are to
1493 A7  80     00358          STA    ,X+     Be put on the diskette
1495 8C  0712   00359          CMPX   #$712   Into locations
1498 25  F5     00360          BLO    IN1     $700 through $711
149A BE  04A0   00361          LDX    #$4A0   Clear bottom part
149D BD  1385   00362          JSR    CLS     Of screen
14A0 8E  155C   00363          LDX    #INIMSG Print Initializing
14A3 BD  1391   00364          JSR    PRINT   Track message
14A6 6F  9F 115A 00365         CLR    [DSKCMD] We want DSKCON to
14AA 6F  9F 115E 00366         CLR    [TRACK] Move head to track 0
14AE AD  9F C004 00367         JSR    [$C004] Use ROM's DSKCON
14B2 A6  9F 1164 00368         LDA    [STATUS] Check status
14B6 1026 FFA2   00369         LBNE   IERROR  Skip back if error
                00370 *With interrupts off, the drive won't shut
                00371 *off automatically after 2 seconds. It keeps
                00372 *running through whole initialization process
14BA 1A  50     00373          ORCC   #$50    Disable interrupts
14BC 20  27     00374          BRA    DOTRK   Jump into loop
14BE 6C  9F 115E 00375 NEWTRK  INC    [TRACK] Inc track number
14C2 A6  9F 115E 00376         LDA    [TRACK] Get track number
14C6 81  23     00377          CMPA   #$23    Are we all done?
14C8 25  03     00378          BLO    IN2     Skip ahead if not
14CA 1C  AF     00379          ANDCC  #$AF    Reenable interrupts
14CC 39         00380          RTS            Return
14CD 81  16     00381 IN2      CMPA   #$16    Doing track 0-21?
14CF 25  08     00382          BLO    NOCOMP  Skip ahead if so
14D1 B6  0986   00383          LDA    $986    Otherwise, we must
14D4 8A  10     00384          ORA    #$10    Turn on the write
14D6 B7  FF40   00385          STA    $FF40   Precompensator
14D9 C6  53     00386 NOCOMP   LDB    #$53    Tell controller to
14DB F7  FF48   00387          STB    $FF48   Move head in one track
14DE 1E  99     00388          EXG    B,B     Time delay so controller
14E0 1E  99     00389          EXG    B,B     Can process command
14E2 BD  D6DE   00390          JSR    $D6DE+VER#9F3 Wait until
                00391 *                       Controller is ready
14E5 8E  04B7   00392 DOTRK    LDX    #$4B7   Screen position
14E8 9F  88     00393          STX    $88     For track number
14EA A6  9F 115E 00394         LDA    [TRACK] Get track number
14EE BD  1441   00395          JSR    PRNUM   Print it on screen
14F1 8E  2000   00396          LDX    #$2000  Bottom of free ram
14F4 BD  D5A7   00397          JSR    $D5A7+VER#9ED Use ROM routine
14F7 8E  1507   00398          LDX    #IN3    Store address at
14FA 8F  0983   00399          STX    $983    $983
14FD 8E  2000   00400          LDX    #$2000  Prepare X register
1500 10BE FF48  00401          LDY    #$FF48  Prepare Y register
1504 7E  D547   00402          JMP    $D547+VER#9ED Use ROM routine
                00403 *                       Which initializes track
1507 B6  FF48   00404 IN3      LDA    $FF48   Read status flags
150A 84  44     00405          ANDA   #$44    Check for error
150C 1027 FFAE  00406          LBEQ   NEWTRK  Loop back if OK
1510 1C  AF     00407          ANDCC  #$AF    Enable interrupts
1512 7E  145C   00408          JMP    IERROR  Go to error
                00409 *
                00410 *Various messages and prompts
                00411 *
1515     44     00412 TITLE    FCC    /DISK BACKUP UTILITY/
1528     0D0D   00413          FDB    $0D0D
152A     00     00414          FCB    $0
152B     53     00415 SRCDRV   FCC    /SOURCE DRIVE NUMBER? /
1540     00     00416          FCB    $0
1541     44     00417 DSTDRV   FCC    /DESTINATION DRIVE NUMBER? /
1558     00     00418          FCB    $0
155C     49     00419 INIMSG   FCC    /INITIALIZING TRACK --) /
1573     00     00420          FCB    $0
1574     52     00421 LMSG     FCC    /READING TRACK --) /
1586     00     00422          FCB    $0
1587     57     00423 WMSG     FCC    /WRITING TRACK --) /
1599     00     00424          FCB    $0
159A     45     00425 ER1MSG   FCC    /ERROR ENCOUNTERED IN SECTOR /
15B6     00     00426          FCB    $0
15B7     0D0D   00427 ER2MSG   FDB    $0D0D
15B9     20     00428          FCC    /  1 - TRY AGAIN/
15C8     0D     00429          FCB    $0D
15C9     20     00430          FCC    /  2 - "INFINITE" RETRY/
15DF     0D     00431          FCB    $0D
15E0     20     00432          FCC    /  3 - SKIP THE SECTOR/
15F5     0D     00433          FCB    $0D
15F6     48     00434          FCC    /HOW DO YOU WISH TO PROCEED? /
1612     00     00435          FCB    $0
1613     4E     00436 INFMSG   FCC    /NOW DOING AN "INFINITE" RETRY/
1630     0D     00437          FCB    $0D
1631     48     00438          FCC    /HOLD DOWN ANY KEY TO STOP/
164A     00     00439          FCB    $0
164B     0D     00440 GOTMSG   FCB    $0D
164C     47     00441          FCC    /GOT IT!/
1653     00     00442          FCB    $0
1654     46     00443 DONE     FCC    /FUNCTION COMPLETE/
1665     00     00444          FCB    $0
1666     44     00445 DRMSG1   FCC    /DRIVE NOT READY!/
1676     00     00446          FCB    $0
1677     44     00447 DRMSG2   FCC    /DISKETTE WRITE PROTECTED!/
1690     00     00448          FCB    $0
1691     44     00449 DRMSG3   FCC    /DEST. DISKETTE WRITE ERROR/
16AB     00     00450          FCB    $0
16AC     56     00451 DRMSG4   FCC    /VERIFICATION ERROR/
16BE     00     00452          FCB    $0
16BF     0D     00453 CANCEL   FCB    $0D
16C0     42     00454          FCC    /BACKUP TERMINATED IN ERROR/
16DA     00     00455          FCB    $0
16DB     0D     00456 AGAIN    FCB    $0D
16DC     50     00457          FCC    /PRESS ENTER TO RUN AGAIN? /
16F6     00     00458          FCB    $0
16F7     49     00459 SRCMSG   FCC    /INSERT SOURCE DISKETTE/
170D     0D     00460          FCB    $0D
170E     41     00461          FCC    /AND PRESS ENTER? /
171F     00     00462          FCB    $0
1720     49     00463 DSTMSG   FCC    /INSERT DESTINATION DISKETTE/
173B     0D     00464          FCB    $0D
173C     41     00465          FCC    /AND PRESS ENTER? /
174D     00     00466          FCB    $0
         1192   00467          END    START   Start execution at START
```


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A Little Tree-Trimming Music

By David Banaszak

Here's a jolly program sent to us by David Banaszak of New Carlisle, Ohio to get you and your family in the holiday spirit. Requiring 16K Extended Color BASIC, *Christmas Carols* provides eight holiday favorites that you or your CoCo can select.

To "spruce up" *Christmas Carols*, David added a star and a Christmas tree found in Radio Shack's "Going Ahead With Extended Color BASIC." One helpful hint: If you wish to add more songs, just edit Lines 38, 39, 40 and 41, and insert more options in the menu Lines 24, 33. Song subroutines can then be added as desired. So, trim the tree, drink some eggnog and sing along with CoCo.

		400	0691
30	0170	600	09D8
100	02EC	2010	0CB3
230	0478	END	0E8B

The Listing:

```
1 XX=RND(-TIMER)
2 CLS:PRINT"DAVID BANASZAK"
3 PRINT"168 STRATMORE"
4 PRINT"NEW CARLISLE,OH45344"
5 FORI=0TO500:NEXT
10 CLS
20 PRINT@1,"SELECT A TUNE"
21 PRINT@17,"MEM LEFT=";MEM
24 PRINT@32,"0-RANDOM ORDER"
25 PRINT@64,"1-DECK THE HALL"
27 PRINT@96,"2-GOOD CHRISTIAN":P
RINT@130,"MEN REJOICE"
28 PRINT@160,"3-JOY TO THE":PRIN
T@194,"WORLD"
29 PRINT@224,"4-JINGLE BELLS"
30 PRINT@256,"5-12DAYS OF":PRINT
@290,"CHRISTMAS"
31 PRINT@320,"6-SILENT NIGHT"
32 PRINT@352,"7-O COME ALL YE ":
PRINT@386,"FAITHFUL"
33 PRINT@416,"8-GOD REST YE MERR
Y":PRINT@450,"GENTLEMEN"
34 INPUT M:KK=RND(5):'KK=PICTURE
#
35 CLS:PRINT@64,STRING$(32,"*"):
PRINT@352,STRING$(32,"*")
38 IF M=0THEN M=RND(8):N=9
39 IF M<1ORM>8THEN10
40 GOSUB2000:ON M GOSUB 100,200,
300,400,500,600,700,800
41 IFN=9 THEN M=RND(8):CLS:KK=RN
D(5):GOTO40
50 GOTO10:'SELECT PICTURE OR RAN
DOM
```

(David Banaszak is an engineer at the Air Force Wright Aeronautical Laboratories at Wright Patterson AFG, Ohio. He, his wife, Pat and four children have used the CoCo for music, budgeting, mailing labels, and of course, games and learning.)

```
100 PRINT@199,"DECK THE HALL"
110 FORI=1TO2
120 A$="O4L4.CO3L8B-L4AGFGAF"
130 B$="L8GAB-GL4.AL8GL4FEL2F"
140 C$="L4.GL8AL4B-L4GL4.AL8B-O4
L4CO3G"
150 D$="L8ABO4L4CL8DEL4FEDL2C"
160 X$="XA$;XB$;":Y$="XC$;XD$;"
170 PLAY X$:PLAYX$:PLAY Y$: PLAY
 X$
180 D$="L8ABO4L4CL8DEL4FEDL2C"
190 NEXT I
199 RETURN
200 SCREEN1,1
210 FOR I=1TO2
220 A$="L8FL4FL8FL4AL8B-O4L4CL8D
L4CL8CO3L4FL8FL4AL8B-O4L4CL8DL4C
P8"
230 B$="O4L4CL8DL4CO3L8B-L4AL8GL
4.FV18L2.FV21FV15L4GL8GL4AL8G"
240 C$="L4FL8GL4AP8L4CL8DL4CO3L8
B-L4AL8GL4FL8FL4GL8GL4AL8G"
250 D$="L4FL8GL4AP8DL8DL4EL8EL4.
FO4CO3L4AL8AL4GL8GL4.FP4"
260 X$="XA$;XB$;":Y$="XC$;XD$;"
270 PLAY X$:PLAY Y$
290 NEXTI
299 RETURN
300 PRINT@199,"JOY TO THE WORLD"
310 A$="O3L2CL4O2BL8AL2.GL4FL2ED
"
320 B$="L2.CP32L4GL2GL2AL4P32AL2
.BP32L4BO3L1.C"
330 C$="L4CCO2L4BAGL4.GL8FL4EO3C
"
340 D$="O3L4CO2BAGP32L4.GL8FL4EP
32EP32EP32EP32EP32EP32L8EF"
350 E$="L2.GL8FEL4DP32DP32DP32L8
DEL2.FL8ED"
355 F$="O2L4CO3L2CO2L4AL4.GL8FL4
EFL2EDL1C"
370 PLAY A$:PLAYB$:PLAYC$:PLAYD$
:PLAYE$:PLAYF$
399 SCREEN 0,0:RETURN
400 PRINT@199,"JINGLE BELLS":SCR
EEN 1,1
410 A$="L4CAGFL2CP4L8CCL4CAGFL2.
DP4L4DB-AGL2.EP4O4L4CCO3B-GL2.AP
4":PLAYA$
420 B$="L4CAGFL2.CP4L4CAGFL2DP4L
4DDB-AGO4CCCCDCO3B-GL2.FP4":PLAY
B$
430 C$="L4AAL2AL4AAL2AL4AO4CO3L4
.FL8GL2.AP4L4B-B-L4.B-L8B-L4B-AA
L8AA":D$="L4AGGAL2GO4CO3":E$="O4
L4CCO3B-GL2.FP4"
440 X$="XC$;XD$;XC$;XE$;"
450 PLAY X$
499 RETURN
500 SCREEN 1,0
510 A$="L8CCL4CL8FFL4FL8EFGAB-GL
4.A":B$="L8B-O4L4CL8DO3B-AFL4GL2
FL8FP4":PLAYA$:PLAYB$
520 C$="L8CCL4CL8FFFL4FL8EFGAB-G
L2":D$="O4L4CO3L8GAL4B-L8A":E$="
L8B-O4L4CL8DO3B-AFL4GL2L2.F":X$=
C$+D$+E$:PLAYX$
521 E$="L8B-O4L4CL8DO3B-AFL4GL2F
L8FP8"
525 F$="L8CCL4CL8FFL4FL8EFGAB-GL
2A":G$="O4L4CO3L8GAB-":X$=F$+G$+
D$+E$:PLAYX$
527 X$=F$+G$+G$+D$+E$:PLAYX$
530 E$="O4L2CL8DO3L4.BO4L2.CP4L8
CO3B-AGL4FB-DFL8GFEDL4CL8AB-O4L4
CL8DO3B-AFL4GL2FL8FP8"
531 X$=F$+E$:PLAY X$
539 D$="O4L4CO3L8GAB-G"
540 X$=F$
541 FOR I=6TO12
542 X$=X$+D$
543 Y$=X$+E$:PLAY Y$
545 NEXT I
599 SCREEN 0,0:RETURN
600 SCREEN1,0
605 FOR I=1TO3
610 A$="L8.GL16AL8.GL4.E"
620 B$="O4L4DL8DO3L4.BO4L4CL8CO3
L4.G"
```


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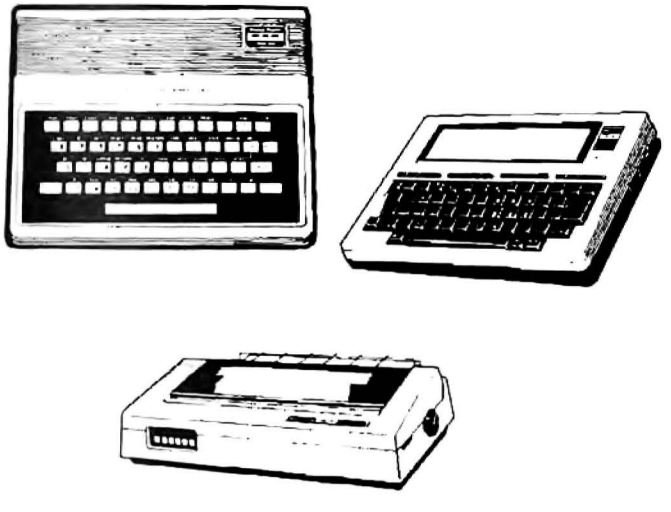
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```
630 C$="L4AL8A04L8.C03L16BL8AL8.
GL16AL8GL4EP8"
640 D$="04L4DL8DL8.FL16D03L8B04L
4.CL4EP8L8.C03L16GL8EL8.GL16FL8D
L4.CL4CP8"
650 X$="T1XA$;XA$;XB$;XC$;XC$;XD
$;T2"
660 PLAYX$
690 NEXTI:RETURN
700 SCREEN1,0
710 A$="L4GL2GL4DGL2ADL4BAB04C03
L2BL4AGL2GL4F+EF+GABL2F+L4.EL8DL
2.DP4"
720 B$="04L2DL4C03B04L2C03BL4ABG
AL2F+L4D"
730 C$="P4L4GGF+GAL2GL4DBBAB04C0
3L2BL4AB04C03BAGL2F+L4G04C03L2BL
4.AL8GL2.G"
750 X$="XA$;XB$;XC$;"
755 FORI=1TO3:PLAYX$:NEXT
790 RETURN
800 SCREEN1,0
810 A$="L4EEBBAGF+EDEF+GAL2.B"
820 B$="P4L4B04C03AB04CDE03BAGEF
+GL2A"
830 C$="L4GAL2B04L4C03BBAGF+L2EL
8GF+L4EL2AL4GAB04CDE03BAGF+L2.E"
850 X$=A$+A$+B$+C$
860 FORI=1TO2:PLAYX$:NEXT:RETURN
```

```
2000 ON KK GOSUB 2010,3000,2010,
2010,2010
2005 RETURN
2010 PMODE 3,1
2015 PCLS
2020 C=1:D=RND(3)+1
2050 PCLS 4:SCREEN 1,0:COLOR C,D
'RS PROG#1,PAGE EXTENDED MANUAL
2220 LINE(90,96)-(118,26),PSET
2225 LINE(146,96)-(118,26),PSET:
LINE(90,96)-(146,96),PSET
2235 DRAW"BM112,96D15R10U15"
2240 LINE(0,112)-(255,96),PSET:P
AINT(128,85),1,1
2247 FOR I=1TO100
2250 X=RND(255):Y=RND(115):A=RND
(4)
2265 PSET(X,Y,A):NEXT
2266 CIRCLE(118,22),A,4
2300 RETURN
3000 PMODE4,1
3005 'REFEXTCOLORMANUAL-#7-1PG15
6
3010 PCLS:SCREEN1,0
3020 DRAW"BM68,116E20BE20E20F20B
F20F20L40BL40L40BU40R40BR40R40G2
0BG20G20H20BH20H20BM128,96NU40ND
40NE20NF20NG20NH20NL40R40"
3040 RETURN
```


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To celebrate Star-Kits' being first with MC-10 software, here's our MC-10 Triple-Pak: MC-10 HUMBUG (normally $29.95), MC-10 REMOTERM (normally $19.95), and MC-10 COMMTERM (a brand new terminal communications program which sells separately for $19.95), a total value of $69.85, all for a special price of just $55.

STAR — KITS

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STAR — KIBBITS

Welcome to the tenth of my monthly chats. Many of you have commented that you enjoy reading them, and they are interesting to write too. So here goes for this month.

In addition to having a Color Computer, do you also have a 6800 or 6809 system on the SS-50 bus? I do, and I suspect some of you do too. I often get a letter from a reader who either wants to buy or sell such a system or components (hardware or software) for it. Unfortunately, some of the older items are hard to get, yet some of you may have an unused one stashed away in the cellar. So why don't we set up an

SS-50 EXCHANGE

If you have some SS-50 item for sale, send me a self-addressed stamped envelope with a description and price written on the back. If you want to buy an SS-50 item, send me a postcard with a note on what you want. I will try to match up a buyer and seller, put the buyer's postcard in the seller's envelope and mail it back out. From that point on, it's up to the seller to contact the buyer and make the deal.

I'm proposing this simply because I really like 6800 and 6809 systems, and hate the thought of something going to waste in someone's cellar, while someone else is desperately looking for it. (as an afterthought, let's extend it to anything that is 6800 or 6809 related.) But since this may potentially involve a lot of work for me, I insist that you follow the rules: postcards for buyers, stamped envelopes for sellers, only one item per card or envelope, clearly stated on postcard or back of envelope.

Now let's see whether we can rescue some of those gems in the cellar or attic!

AMDEK TOO

Yes, we've gotten a pair of Amdek 3" drives, and now supply our software on Amdek disks too. Just specify on your order. There's a $3 extra charge due to extra handling and higher media costs. By the way, those little 3" disks are neat.

SPEAKING OF NEAT THINGS

The little MC-10 computer is also quite neat. It uses a 6803 microprocessor, which is more like a 6800 than a 6809. I'm sure that it's used because it contains two input/output ports which save the expense of an external I/O chip. Interestingly enough, the 6803 has a built-in port for serial input and output, but the MC-10 doesn't use it because it doesn't support 600-baud operation, needed for compatibility with the larger Color Computer. Instead, serial output is handled the same way as on the Color Computer, with a software routine. Though the manual doesn't say so, you can change the output baud rate by an appropriate poke. For example POKE 16932,245 switches the output to 300 baud. You can try other values for other baud rates too.

By the way, the MC-10 also has the CLOADM and EXEC commands, though the book doesn't mention them. We use those in our MC-10 software. Available so far are the HUMBUG monitor, REMOTERM remote terminal package, and COMMTERM communications program. A disassembler is coming too.

SPELL 'N FIX

Regardless of whose text processor you use, let SPELL 'N FIX find and fix your spelling and typing mistakes. It reads text faster than you can, and spots and corrects errors even experienced proofreaders miss. It is compatible with all Color Computer text processors. $69.29 in the Radio Shack disk or cassette versions; $178.58 in the Flex version. (20,000 word dictionary is standard; optional 75,000 word Super Dictionary costs $50 additional.)

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A complete monitor and debugging system which lets you input programs and data into memory, list memory contents, insert multiple breakpoints, single-step, test, checksum, and compare memory contents, find data in memory, start and stop programs, upload and download, save to tape, connect the Color Computer to a terminal, printer, or remote computer, and more. HUMBUG on disk or cassette costs just $39.95, special 64K version for FLEX or STAR-DOS 64 costs $59.95, MC-10 version $29.95.

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STAR FLEX

The best implementation of FLEX for the Color Computer. Complete with all utilities, text editor, macro assembler, and HUMBUG debug monitor, $225.00.

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Three programs in one — a full function Editor, a Text Processor and a Mailing List/Label program. All this for just $50. Requires STAR-DOS and 32K, or STAR-DOS 64, or FLEX, specify which.

DBLS for Data Bases

DBLS stands for Data Base Lookup System. A super-fast system for searching for a selected record in a sequential disk file. Supplied with SPELL 'N FIX's 20,000 word dictionary as a sample data file — lets you look up the spelling of any word in under FOUR seconds. Priced at $29.95. Requires STAR-DOS.

CHECK 'N TAX

Home accounting package combines checkbook maintenance and income tax data collection. Written in Basic for either RS Disk or Flex, $50.

REMOTERM

REMOTERM — makes your CoCo or MC-10 into a host computer, operated from a remote terminal. $19.95, disk or cassette.

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NEWTALK — a memory examine utility for machine language programmers which reads out memory contents through the TV set speaker. $20, disk or cassette.

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32K ECB

the RAINBOW

Are You Authorized To Use This Frequency?

By B.B. Witham, Jr.

As in past programs, I have attempted to automate as much of the data requirements for my ham station as I could. CoCo, as usual, can do it quicker and with much more facility than I can. I have all my ham radio utility programs on one disk, with a menu always up on screen where I can call up whatever program suits my need of the moment.

This latest offering is a review of all the amateur frequency allocations, by operator class. If one is not authorized to use a particular band, the program will inform him or her, right now!

The program takes up a little over 12K of memory but does not require disk (Extended BASIC is required). It operates very simply: enter your class of license, then the frequency band in question. The screen will show a graphic display of the operator limits and privileges for that band. Entering an "X" will exit the program, while the spacebar or *ENTER* will take you back to the menu for another selection.

The graphic letter set is somewhat slow, even with the "Vitamin *POKE*," but I wanted to keep the program in BASIC for the novice class (programmer, not ham operator). Feel free to substitute one of the many assembly language programs available, if you want more speed. By the way, if your CoCo will not handle it, remove the speed up *POKEs* (65495,0 and 65494,0) from the program.

The use of *PMODE* to show colors doesn't give the best definition, but it does help to differentiate the various frequency allocations; besides, it's easier to *PAINT* than to try to crosshatch.

So, add this to your library of "hamplications" and enjoy. (Tapes available from me or through "Rainbow on Tape".)



```
120....02DD    1610...1A8B
210.....054E   1750...1D41
410....07C7    1870...1F6A
550....0A06    2020....2230
690....0C42    2160....2434
850....0EE9    2320....2685
990.....1143   2530...28D8
1160...138C    2670...2B45
1300...15EA    2800...2D88
1460....1847   END....3037
```

The listing:

```
10 '*****************************
20 '* AMATEUR RADIO- FREQUENCY *
30 '*          ALLOCATIONS      *
40 '* BY:B.B.WITHAM JR.  W4CNZ *
   *     3501 SEA GULL RD.      *
50 '* VIRGINIA BEACH,VA. 23452 *
60 '*    VERSION 1.1  8/4/83    *
   *    ALL RIGHTS RESERVED     *
70 '*****************************
80 CLS5:Z=180
90 Y=42:FORX=1024 TO1055:POKEX,Y
:POKEX+480,Y:NEXT:FORX=1024 TO15
35STEP32:POKEX,Y:POKEX-1,Y:NEXT
100 PRINT@165," FREQUENCY ALLOCA
TIONS ";:PRINT@201," FOR HAM RAD
IO ";:FORTTM=1 TO999:NEXT:PRINT@
419," BY:BURT WITHAM JR. W4CNZ "
;:PRINT@451," VIRGINIA BEACH,VA.
 23452 ";:FORTM=1 TO1000:NEXT:CL
S8:SOUNDZ,1
110 C$=" ":PRINT@32," ENTER YOUR
 LICENSE CLASS          E=EXTRA
 A=ADVANCED             G=GENERAL
 T=TECHNICIAN           N=NOVICE";
C$
120 PRINT@451,;:INPUT"HIT 'X' TO
 EXIT PROGRAM";C$
130 SOUNDZ,1:IFC$="E"ORC$="A"ORC
$="G"ORC$="T"ORC$="N" THEN150 EL
SEIFC$="X" THEN440
140 IFC$<>"E"ORC$<>"A"ORC$<>"G"O
RC$<>"T"ORC$<>"N" THENCLS:SOUND5
,10:PRINT@129,"THERE IS NO SUCH
CLASS.          TRY AGAIN.":FORTM
=1 TO999:NEXTTM:CLS:GOTO110 ELSE
150
150 CLS7:SOUNDZ,1:PRINT@256,;:IN
PUT" ENTER FREQUENCY BAND DESIRE
D    (IN METERS)";F
160 SOUNDZ,1:IFF=750RF=800RF=400
RF=300RF=200RF=150RF=100RF=60RF=
2 THEN170 ELSECLS:SOUND5,10:PRIN
T@129,"THERE IS NO SUCH BAND FOR
 HAM  RADIO.  TRY AGAIN":FORTM=1
 TO999:NEXTTM:CLS:GOTO150
170 IFC$="A" THEN250 ELSEIFC$="G
" THEN300 ELSEIFC$="N" THEN350 E
LSEIFC$="T" THEN400
200 '** EXTRA
210 IFF=750RF=80 THENGOSUB500 EL
SEIFF=40 THENGOSUB800 ELSEIFF=30
 THENGOSUB1700 ELSEIFF=20 THENGO
SUB1100 ELSEIFF=15 THENGOSUB1400
 ELSEIFF=10 THENGOSUB1800 ELSEIF
F=6 THENGOSUB2000 ELSEIFF=2 THEN
GOSUB2200
220 A$=INKEY$:IFA$="" THEN220
230 GOTO110
250 '** ADVANCED
260 IFF=750RF=80 THENGOSUB500 EL
SEIFF=40 THENGOSUB800ELSEIFF=30
THENGOSUB1700 ELSEIFF=20 THENGOS
UB1100 ELSEIFF=15 THENGOSUB1400
ELSEIFF=10 THENGOSUB1800 ELSEIFF
=6 THENGOSUB2000 ELSEIFF=2 THENG
OSUB2200
270 A$=INKEY$:IFA$="" THEN270
280 GOTO110
300 '** GENERAL
310 IFF=750RF=80 THENGOSUB500 EL
SEIFF=40 THENGOSUB800 ELSEIFF=30
 THENGOSUB1700 ELSEIFF=20 THENGO
SUB1100 ELSEIFF=15 THENGOSUB1400
 ELSEIFF=10 THENGOSUB1800 ELSEIF
F=6 THENGOSUB2000 ELSEIFF=2 THEN
GOSUB2200
320 A$=INKEY$:IFA$="" THEN320
330 GOTO110
350 '** NOVICE
360 IFF=750RF=80 THENGOSUB500 EL
SEIFF=40 THENGOSUB800 ELSEIFF=15
 THENGOSUB1400 ELSEIFF=10 THENGO
SUB1800 ELSEIFF=60RF=2 THEN3010
370 A$=INKEY$:IFA$="" THEN370
380 GOTO110
400 '** TECHNICIAN
410 IFF=80 THENGOSUB500 ELSEIFF=
40 THENGOSUB800 ELSEIFF=10 THENG
```

(Capt. Witham, retired USN has hobbies in ham radio and computers. Combining the two, he has published several programs for ham radio utilities on CoCo. He also owns Burwith Computer Service, Inc.)

```
OSUB1800 ELSEIFF=6 THENGOSUB2000
 ELSEIFF=2 THENGOSUB2200 ELSEGOT
O3010
420 A$=INKEY$:IFA$="" THEN420
430 GOTO110
440 CLS:PRINT@174,"END":FORTM=1
TO999:NEXT:CLS:RUN"LIST"
500 '** SEVENTY-FIVE/EIGHTY MTRS
510 GOSUB2380
520 LINE(60,10)-(80,160),PSET,B:
LINE(60,130)-(58,130),PSET:LINE(
60,100)-(58,100),PSET:LINE(58,70
)-(60,70),PSET:LINE(60,40)-(58,4
0),PSET:LINE(60,93)-(120,93),PSE
T
530 LINE(100,100)-(80,160),PSET,
B:LINE(121,159)-(101,160),PSET:L
INE(122,160)-(122,127),PSET:LINE
(81,14)-(101,93),PSET,B:LINE(121
,93)-(101,14),PSET,B:LINE(101,12
7)-(121,127),PSET
540 LINE(121,87)-(141,72),PSET,B
:LINE(123,160)-(60,160),PSET:LIN
E(60,159)-(120,159),PSET:LINE(16
0,90)-(170,100),PSET,B:PAINT(165
,95),3,4:LINE(160,105)-(170,115)
,PSET,B:PAINT(165,110),4,4
550 IFC$="E" THENPAINT(65,20),3,
4:PAINT(65,150),4,4
560 IFC$="A" THENPAINT(90,20),3,
4:PAINT(90,150),4,4
570 IFC$="G" THENPAINT(115,25),3
,4:PAINT(115,150),4,4
580 IFC$="N"ORC$="T" THENPAINT(1
25,85),3,4
590 POKE65495,0:DRAW"C3;S8;BM155
,40":AA$="75/80 M":GOSUB2400
600 DRAW"C3;S4;BM20,10":AA$="3.5
00":GOSUB2400
610 DRAW"C3;S4;BM20,20":AA$="3.5
25":GOSUB2400
620 DRAW"C3;S4;BM20,44":AA$="3.6
00":GOSUB2400
630 DRAW"C3;S4;BM20,70":AA$="3.7
00":GOSUB2400
640 DRAW"C3;S4;BM20,86":AA$="3.7
50":GOSUB2400
650 DRAW"C3;S4;BM20,96":AA$="3.7
75":GOSUB2400
660 DRAW"C3;S4;BM20,106":AA$="3.
800":GOSUB2400
670 DRAW"C3;S4;BM20,127":AA$="3.
890":GOSUB2400
680 DRAW"C3;S4;BM20,135":AA$="3.
900":GOSUB2400
690 DRAW"C3;S4;BM20,164":AA$="4.
000":GOSUB2400
700 DRAW"C2;S4;BM175,97":AA$="CW
":GOSUB2400
710 DRAW"C2;S4;BM175,112":AA$="C
W/VOICE/TV":GOSUB2400
720 DRAW"C2;S4;BM175,123":AA$="F
AX":GOSUB2400
730 IFC$="E" THENDRAW"C2;S6;BM64
,172":AA$="E":GOSUB2400
740 IFC$="A" THENDRAW"C2;S6;BM84
,172":AA$="A":GOSUB2400
750 IFC$="G" THENDRAW"C2;S6;BM10
4,172":AA$="G":GOSUB2400
760 IFC$="N"ORC$="T" THENDRAW"C2
;S6;BM124,172":AA$="G/T":GOSUB24
00
770 GOTO2370
800 '** FORTY METERS
810 GOSUB2380
820 LINE(50,10)-(70,130),PSET,B:
LINE(50,90)-(49,90),PSET:LINE(49
,50)-(50,50),PSET:LINE(71,20)-(9
1,130),PSET,B
830 LINE(111,70)-(91,20),PSET,B:
LINE(91,130)-(111,101),PSET,B:LI
NE(51,70)-(91,70),PSET
840 LINE(110,50)-(128,70),PSET,B
:LINE(160,90)-(170,100),PSET,B:P
AINT(165,95),3,4:LINE(160,105)-(
170,115),PSET,B:PAINT(165,110),4
,4
850 IFC$="E" THENPAINT(65,20),3,
4:PAINT(65,100),4,4:PAINT(65,120
```


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```
),2,4
860 IFC$="A" THENPAINT(80,25),3,
4:PAINT(80,100),2,4:PAINT(80,120
),4,4
870 IFC$="G" THENPAINT(100,25),3
,4:CLS:PAINT(100,110),4,4
880 IFC$="N"ORC$="T" THENPAINT(1
15,60),3,4
890 POKE65495,0:DRAW"C3;S8;BM155
,40":AA$="40 M":GOSUB2400
900 DRAW"C3;S4;BM12,10":AA$="7.0
00":GOSUB2400
910 DRAW"C3;S4;BM12,20":AA$="7.0
25":GOSUB2400
920 DRAW"C3;S4;BM12,54":AA$="7.1
00":GOSUB2400
930 DRAW"C3;S4;BM12,72":AA$="7.1
50":GOSUB2400
940 DRAW"C3;S4;BM12,92":AA$="7.2
00":GOSUB2400
950 DRAW"C3;S4;BM12,102":AA$="7.
225":GOSUB2400
960 DRAW"C3;S4;BM12,135":AA$="7.
300":GOSUB2400
970 IFC$="E" THENDRAW"C2;S6;BM64
,140":AA$="E":GOSUB2400
980 IFC$="A" THENDRAW"C2;S6;BM84
,172":AA$="A":GOSUB2400
990 IFC$="G" THENDRAW"C2;S6;BM10
4,172":AA$="G":GOSUB2400
1000 IFC$="N"ORC$="T" THENDRAW"C
2;S6;BM124,172":A$="N/T":GOSUB24
00
1010 DRAW"C2;S4;BM175,97":AA$="C
W":GOSUB2400
1020 DRAW"C2;S4;BM175,112":AA$="
CW/VOICE/TV":GOSUB2400
1030 DRAW"C2;S4;BM175,123":AA$="
FAX":GOSUB2400
1040 GOTO2370
1100 '** TWENTY METERS
1110 GOSUB2380
1120 LINE(50,10)-(70,150),PSET,B
:LINE(50,50)-(49,50),PSET:LINE(4
9,90)-(50,90),PSET
1130 LINE(50,130)-(49,130),PSET:
LINE(71,82)-(91,150),PSET,B:LINE
(91,102)-(111,150),PSET,B:LINE(5
0,72)-(70,72),PSET:LINE(71,20)-(
91,82),PSET,B:LINE(91,20)-(111,1
02),PSET,B
1140 LINE(160,90)-(170,100),PSET
,B:PAINT(165,95),3,4:LINE(160,10
5)-(170,115),PSET,B:PAINT(165,11
0),4,4
1150 IFC$="T"ORC$="N" THEN3010
1160 IFC$="E" THENPAINT(65,20),3
,4:PAINT(65,140),4,4:PAINT(65,10
```


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4-1434

```
Ø),2,4
1170 IFC$="A" THENPAINT(85,25),3
,4:PAINT(85,140),4,4:PAINT(85,10
Ø),2,4
1180 IFC$="G" THENPAINT(105,25),
3,4:PAINT(105,140),4,4
1190 POKE65495,Ø:DRAW"C3;S8;BM15
5,40":AA$="20 M":GOSUB2400
1200 DRAW"C3;S4;BM6,10":AA$="14.
000":GOSUB2400
1210 DRAW"C3;S4;BM6,20":AA$="14.
025":GOSUB2400
1220 DRAW"C3;S4;BM6,54":AA$="14.
100":GOSUB2400
1230 DRAW"C3;S4;BM6,72":AA$="14.
150":GOSUB2400
1240 DRAW"C3;S4;BM6,82":AA$="14.
175":GOSUB2400
1250 DRAW"C3;S4;BM6,92":AA$="14.
200":GOSUB2400
1260 DRAW"C3;S4;BM6,102":AA$="14
.225":GOSUB2400
1270 DRAW"C3;S4;BM6,154":AA$="14
.350":GOSUB2400
1280 IFC$="E" THENDRAW"C2;S6;BM6
Ø,172":AA$="E":GOSUB2400
1290 IFC$="A" THENDRAW"C2;S6;BM8
4,172":AA$="A":GOSUB2400
1300 IFC$="G" THENDRAW"C2;S6;BM1
Ø4,172":AA$="G":GOSUB2400
1310 DRAW"C2;S4;BM175,97":AA$="C
W":GOSUB2400
1320 DRAW"C2;S4;BM175,112":AA$="
CW/VOICE/TV":GOSUB2400
1330 DRAW"C2;S4;BM175,120":AA$="
FAX":GOSUB2400
1340 GOTO2370
1400 '** FIFTEEN METERS
1410 GOSUB2380
1420 LINE(50,104)-(70,104),PSET:
LINE(70,184)-(50,4),PSET,B:LINE(
49,44)-(50,44),PSET:LINE(50,84)-
(49,84),PSET:LINE(49,124)-(50,12
4),PSET:LINE(50,164)-(49,164),PS
ET
1430 LINE(71,110)-(91,184),PSET,
B:LINE(91,144)-(111,184),PSET,B:
LINE(71,104)-(111,14),PSET,B:LIN
E(91,14)-(91,104),PSET
1440 LINE(131,84)-(111,44),PSET,
B:LINE(160,90)-(170,100),PSET,B:
PAINT(165,95),3,4:LINE(160,105)-
(170,115),PSET,B:PAINT(165,110),
4,4
1450 IFC$="E" THENPAINT(65,20),3
,4:PAINT(65,150),4,4:PAINT(65,12
Ø),2,4
1460 IFC$="A" THENPAINT(80,25),3
,4:PAINT(80,150),4,4:PAINT(80,12
Ø),2,4
1470 IFC$="G" THENPAINT(100,25),
3,4:PAINT(100,150),4,4
1480 IFC$="N" THENPAINT(115,80),
3,4
1490 IFC$="T" THEN3010
1500 POKE65495,Ø:DRAW"C3;S8;BM15
5,40":AA$="15 M":GOSUB2400
1510 DRAW"C3;S4;BM6,10":AA$="21.
000":GOSUB2400
1520 DRAW"C3;S4;BM6,20":AA$="21.
025":GOSUB2400
1530 DRAW"C3;S4;BM6,48":AA$="21.
100":GOSUB2400
1540 DRAW"C3;S4;BM6,86":AA$="21.
200":GOSUB2400
1550 DRAW"C3;S4;BM6,102":AA$="21
.250":GOSUB2400
1560 DRAW"C3;S4;BM6,112":AA$="21
.275":GOSUB2400
1570 DRAW"C2;S4;BM6,126":AA$="21
.300":GOSUB2400
1580 DRAW"C2;S4;BM6,146":AA$="21
.350":GOSUB2400
1590 DRAW"C2;S4;BM6,166":AA$="21
.400":GOSUB2400
1600 DRAW"C2;S4;BM6,188":AA$="21
.450":GOSUB2400
1610 DRAW"C2;S4;BM175,97":AA$="C
W":GOSUB2400
```


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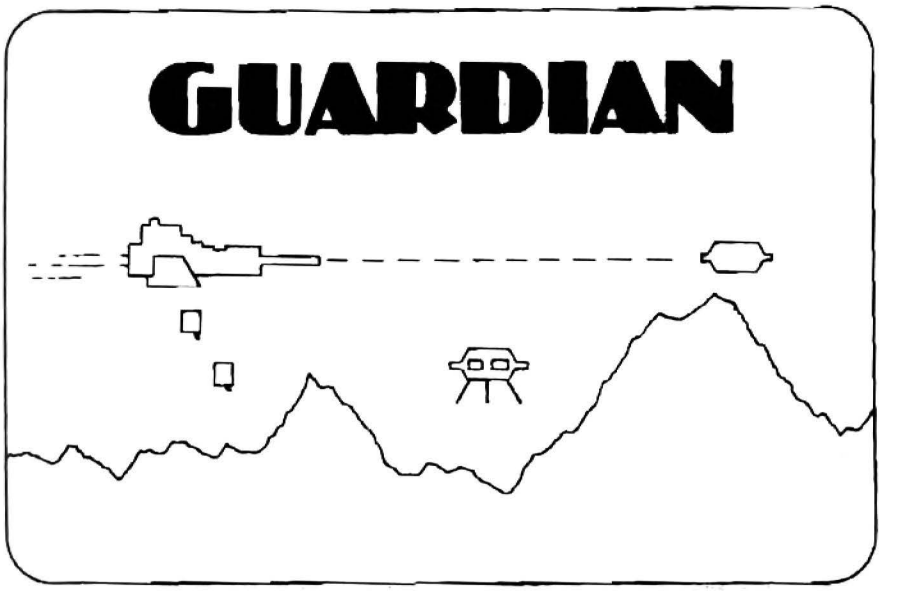


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```
1620 DRAW"C2;S4;BM175,112":AA$="
CW/VOICE/TV":GOSUB2400
1630 DRAW"C2;S4;BM175,123":AA$="
FAX":GOSUB2400
1640 IFC$="E" THENDRAW"C2;S4;BM6
0,190":AA$="E":GOSUB2400
1650 IFC$="A" THENDRAW"C2;S4;BM8
0,190":AA$="A":GOSUB2400
1660 IFC$="G" THENDRAW"C2;S4;BM1
00,190":AA$="G":GOSUB2400
1670 IFC$="N" THENDRAW"C2;S4;BM1
22,188":AA$="N":GOSUB2400
1680 GOTO2370
1700 '** THIRTY METERS
1710 GOSUB2380:LINE(50,10)-(70,1
50),PSET,B:LINE(70,20)-(49,20),P
SET:LINE(49,120)-(70,120),PSET:L
INE(70,150)-(49,150),PSET:PAINT(
60,12),3,4:PAINT(60,140),3,4
1720 IFC$="N" OR C$="T" THEN3010
1730 POKE65495,0:DRAW"C3;S8;BM15
5,40":AA$="30 M":GOSUB2400:DRAW"
C3;S4;BM8,10":AA$="10.1":GOSUB24
00:DRAW"C3;S4;BM8,20":AA$="10.10
9":GOSUB2400
1740 DRAW"C3;S4;BM8,120":AA$="10
.115":GOSUB2400:DRAW"C3;S4;BM8,1
50":AA$="10.150":GOSUB2400
1750 DRAW"C3;S4;BM8,150":AA$="10
.150":GOSUB2400
1760 LINE(160,90)-(170,100),PSET
,B:PAINT(162,96),3,3
1770 DRAW"C2;S4;BM175,97":AA$="C
W/RTTY":GOSUB2400
1780 DRAW"C2;S6;BM40,178":AA$="E
/A/G":GOSUB2400
1790 GOTO2370
1800 '** TEN METERS
1810 GOSUB2380
1820 LINE(50,10)-(70,180),PSET,B
:LINE(50,60)-(49,60),PSET:LINE(5
0,110)-(49,110),PSET:LINE(49,160
)-(47,160),PSET:LINE(70,60)-(50,
60),PSET
1830 LINE(71,20)-(91,30),PSET,B:
LINE(160,90)-(170,100),PSET,B:PA
INT(165,95),3,4:LINE(160,120)-(1
70,130),PSET,B:PAINT(165,125),4,
4
1840 IFC$="N"ORC$="T" THENPAINT(
75,25),3,4
1850 IFC$="E"ORC$="A"ORC$="G" TH
ENPAINT(60,25),3,4:PAINT(60,140)
,4,4
1860 POKE65495,0:DRAW"C3;S8;BM15
5,40":AA$="10 M":GOSUB2400
1870 DRAW"C3;S4;BM6,10":AA$="28.
000":GOSUB2400
1880 DRAW"C3;S4;BM6,20":AA$="28.
100":GOSUB2400
1890 DRAW"C3;S4;BM6,32":AA$="28.
200":GOSUB2400
1900 DRAW"C3;S4;BM6,60":AA$="28.
500":GOSUB2400
1910 DRAW"C3;S4;BM6,110":AA$="29
.000":GOSUB2400
1920 DRAW"C3;S4;BM6,162":AA$="29
.500":GOSUB2400
1930 DRAW"C3;S4;BM6,180":AA$="29
.700":GOSUB2400
1940 DRAW"C2;S4;BM175,97":AA$="C
W":GOSUB2400
1950 DRAW"C2;S4;BM175,127":AA$="
CW/VOICE/TV":GOSUB2400
1960 DRAW"C2;S4;BM175,141":AA$="
FAX":GOSUB2400
1970 IFC$="E"ORC$="A"ORC$="G" TH
ENDRAW"C2;S4;BM48,188":AA$="E/A/
G":GOSUB2400
1980 IFC$="N"ORC$="T" THENDRAW"C
2;S4;BM70,188":AA$="N/T":GOSUB24
00
1990 GOTO2370
2000 '** 6 METERS
2010 GOSUB2380:LINE(50,10)-(70,1
70),PSET,B:LINE(50,50)-(49,50),P
SET:LINE(49,90)-(50,90),PSET:LIN
E(50,130)-(49,130),PSET
2020 LINE(50,20)-(70,20),PSET:LI
```


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Arcade Action. Method of play you are the Grabber. The object is to grab the 8 treasures and store them in the center boxes. You start with 3 Grabbers and get extra ones at 20,000 points. Watch out for the googlies! Super high resolution graphics.

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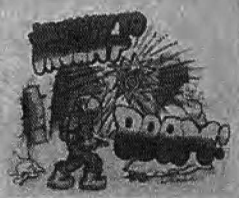
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"THE FROG"



ARCADE ACTION
This one will give you hours of exciting play... Cross the busy highway to the safety of the median and rest awhile before you set out across the swollen river teaming with hidden hazards. Outstanding sound and graphics.

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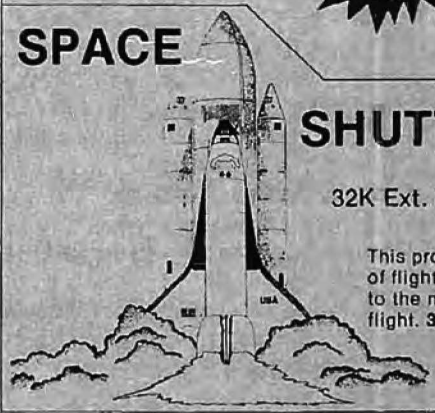
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32K Ext. Basic

This program gives you the real feeling of flight. Full instrumentation complete to the max. Actual simulation of space flight. **32K Extended Basic**

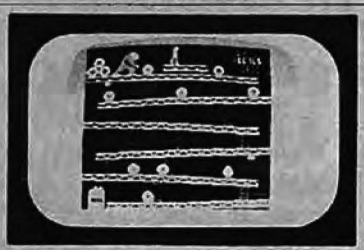


16K MACHINE LANGUAGE
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By KEN KALISH

ARCADE ACTION
The "Pitfalls" in this game are many. Hidden treasures, jump over the pits, swing on the vine, watch out for alligators, beware of the scorpion. Another game for the Color Computer with the same high resolution graphics as "The King."



THE KING

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NEW

STORY PROBLEMS is a program that is designed to give practice in solving STORY PROBLEMS (sometimes called STATEMENT, THOUGHT or WORD PROBLEMS) on the COLOR COMPUTER. It is suitable for use in either a home or school environment. It is also a tool that will allow you to create new story problems to suit your children's needs and ability levels. It has many features that make it particularly attractive: Story problems involving addition, subtraction, multiplication, division or a combination of the four are presented to the student by slowly scrolling each letter of each problem onto the screen. Up to 5 students may use the program at the same time. There are 4, user modifiabale, skill levels.
16K Ext. Basic **TAPE $19.95**

SPELLING TEST is designed to give a standard oral spelling test using the audio track of the computer's tape recorder to dictate test words and sample sentences. Student responses are typed on the keyboard and checked by the computer. Results are displayed on the screen and (if connected) on a printer. **REQUIRES 16K EXT. BASIC $19.95**

MATH DRILL is a program designed to help children to practice addition, subtraction, multiplication, and division skills on the COLOR COMPUTER. It has several features that make its use particularly attractive.
- •Up to 6 students may use the program at the same time.
- •Answers for addition, subtraction and multiplication are entered from right to left, just as they are written on paper.
- •Commas may be included in the answers.
- •Partial products for the multiplication problems may be computed on the screen.
- •Division answers that have a remainder are entered as a whole number followed by the letter "R" and the remainder.
- •There are ten, user modifiable, skill levels.
- •A "SMILEY FACE" is used for motivation and reward. Its size increases relative to the skill level.
- •Skill levels automatically adjust to the student's ability.
- •A timer measures the time used to answer each problem and the total time used for a series of problems.
- •After a problem has been answered incorrectly the correct answer appears under (above in division) the incorrect answer.

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WORD DRILL is designed to give a multiple choice vocabulary quiz. Words and definitions are entered into the program from the keyboard or from a tape file. The computer displays a randomly chosen definition and eight word choices. The student must enter his response before a built in timer reaches zero.

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ESTIMATE is a program designed to help children to practice estimating the answers to addition, subtraction, multiplication and division problems on the COLOR COMPUTER. It has many features that make its use particularly attractive:
- •Up to 5 students may use the program at the same time.
- •There are 5, user modifiable, skill levels.
- •The acceptable percent error may be changed as a student's skill improves.
- •A timer measures the number of seconds used to answer each problem and the total time used for a series of problems.
- •If a problem has been answered incorrectly, the student is told the percent error and asked to try again.
- •If a problem is answered incorrectly a second time, the student is told the correct answer and the range of acceptable answers is displayed.
- •A report is given at the end of each set of problems that includes the number of problems done, the number of problems answered correctly on the first try and the average percent error.
- •The (BREAK) key has been disabled so that a child will not inadvertently stop the program from running.

16K EXT. BASIC $19.95

TEACHERS' DATABASE is a program designed to allow a teacher to keep a computerized file of information about his/her students. There are many features that make this program particularly attractive.
- • Information on as many as 100 students (or more) may be in the computer at one time.
- • Each student may have as many as 20 (or more) individual items of data in his/her record.
- • The program will run from cassette or disk.
- • Cassette and disk files are completely compatable.
- • The program is menu driven.
- • Records may be easily changed, deleted, combined or added.
- • Information about students may be numerical or text.
- • Records may be quickly alphabetized.
- • Records may be sorted by various criteria.
- • Records may be reordered (ranked) based on test scores or other data.
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NE(160,90)-(170,100),PSET,B:PAIN
T(165,95),3,4:LINE(160,120)-(170
,130),PSET,B:PAINT(165,125),4,4
2030 IFC$="N" THEN3010
2040 PAINT(60,13),3,4:PAINT(60,1
00),4,4
2050 POKE65495,0:DRAW"C3;S8;BM15
5,40":AA$="6 M":GOSUB2400
2060 DRAW"C3;S4;BM8,10":AA$="50.
0":GOSUB2400
2070 DRAW"C3;S4;BM8,20":AA$="50.
1":GOSUB2400
2080 DRAW"C3;S4;BM8,50":AA$="51.
0":GOSUB2400
2090 DRAW"C3;S4;BM8,90":AA$="52.
0":GOSUB2400
2100 DRAW"C3;S4;BM8,130":AA$="53
.0":GOSUB2400
2110 DRAW"C3;S4;BM8,170":AA$="54
.0":GOSUB2400
2120 DRAW"C2;S4;BM175,97":AA$="C
W":GOSUB2400
2130 DRAW"C2;S4;BM175,127":AA$="
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2150 IFC$="N" THEN3010
2160 DRAW"C2;S6;BM40,188":AA$="E
/A/G/T:GOSUB2400
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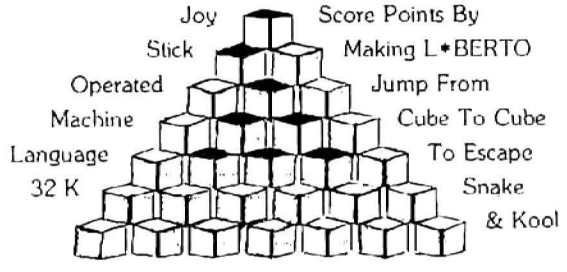

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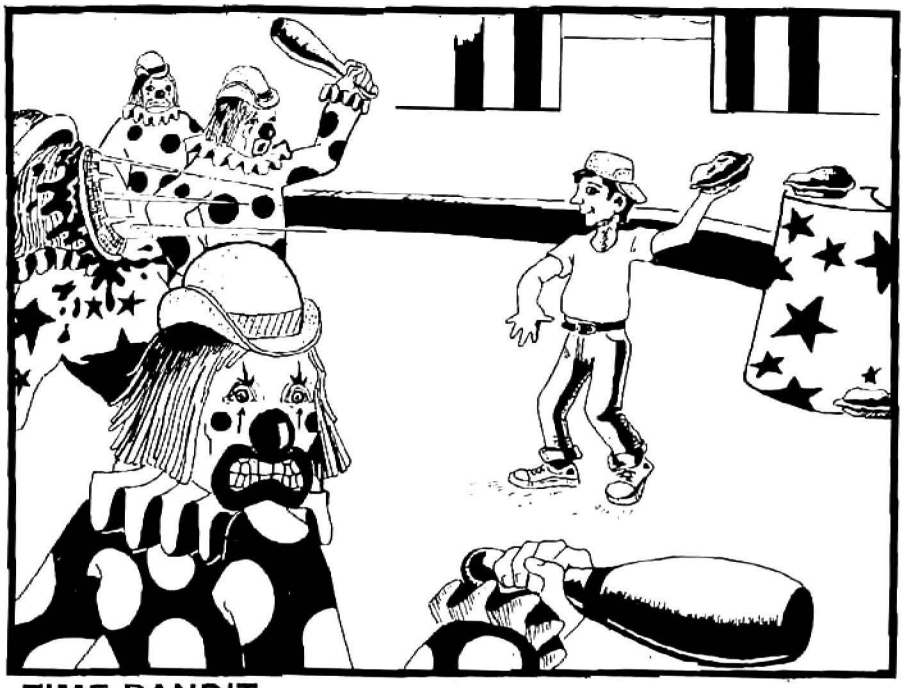
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```
2170 GOTO2370
2200 '** 2 METERS
2210 GOSUB2380:LINE(50,10)-(70,1
70),PSET,B:LINE(50,50)-(49,50),P
SET:LINE(49,90)-(50,90),PSET:LIN
E(50,130)-(49,130),PSET
2220 LINE(50,20)-(70,20),PSET:LI
NE(160,90)-(170,100),PSET,B:PAIN
T(165,95),3,4:LINE(160,110)-(170
,120),PSET,B:PAINT(165,115),4,4
2230 IFC$="N" THEN3010
2240 PAINT(60,13),3,4:PAINT(60,1
00),4.4
2250 POKE65495,0:DRAW"C3;S8;BM15
5,40":AA$="2 M":GOSUB2400
2260 DRAW"C3;S4;BM8,10":AA$="144
.0":GOSUB2400
2270 DRAW"C3;S4;BM8,20":AA$="144
.1":GOSUB2400
2280 DRAW"C3;S4;BM8,50":AA$="145
.0":GOSUB2400
2290 DRAW"C3;S4;BM8,90":AA$="146
.0":GOSUB2400
2300 DRAW"C3;S4;BM8,130":AA$="14
7.0":GOSUB2400
2310 DRAW"C3;S4;BM8,170":AA$="14
8.0":GOSUB2400
2320 DRAW"C2;S4;BM175,97":AA$="C
W":GOSUB2400
2330 DRAW"C2;S4;BM175,117":AA$="
CW/VOICE/TV":GOSUB2400
2340 DRAW"C2;S4;BM176,127":AA$="
FAX":GOSUB2400
2350 IFC$="N" THEN3010
2360 DRAW"C2;S4;BM40,186":AA$="E
/A/G/T":GOSUB2400
2370 CLS:POKE65494,0:RETURN
2380 PMODE3,1:PCLS:SCREEN1,1:RET
URN
2400 '** CHARACTER GENERATOR
2410 FORXX=1 TOLEN(AA$)
2420 RESTORE:LL=0
2430 READLL$,CC$
2440 IFLL$=MID$(AA$,XX,1) THEN D
RAWCC$:GOTO2460
2450 LL=LL+1:IFLL<48 THEN2430
2460 NEXT:RETURN
2470 DATA " ","BM+7,0"
2480 DATA "A","U4;E2;F2;D2;NL4;D
2;BM+3,0"
2490 DATA "B","U6;R3;F1;D1;G1;NL
3;F1;D1;G1;L3;BM+7,0"
2500 DATA "C","BM+1,-0;H1;U4;E1;
R2;F1;BM+0,+4;G1;L2;BM+6,0"
2510 DATA "D","U6;R3;F1;D4;G1;L3
;BM+7,0"
2520 DATA "E","NR4;U3;NR2;U3;R4;
BM+3,+6"
2530 DATA "F","U3;NR2;U3;R4;BM+3
,+6"
```

- COMPUTER SHACK -



MUDPIES

by Jeff Sorenson & Phillip McKenzie

THE KID IS IN TROUBLE!!! Arnold went to see the circus. It was great! Full of acrobats, animals, side show acts, and as always... CLOWNS! The kid is surrounded by clowns, and picking up some Mudpies he starts throwing them at the clowns. But the clowns get mad and start throwing things back at Arnold! Can you help Arnold make it to safety? As you avoid the mad clowns, throwing mudpies at them, you might make it to the exit.. only to find more rooms filled with more clowns. Will Arnold ever make it home?

Mudpies is great, it is totally random with many different screens, it will be different every time you play. Guaranteed hours and hours of fun.

Tape..... 27.95 Disk..... 29.95

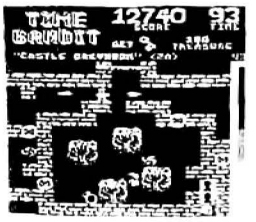
TIME BANDIT

by Bill Dunlevy

FANTASTIC ADVENTURES AND UNLIMITED RICHES ABOUND WHEN ONE TRAVELS THROUGH TIME — YOU ARE THE TIME BANDIT!

Thanks to Bill Dunlevy and Harry Lafnear, you can transform your Color Computer into the ultimate arcade experience. 32K has never looked or played better!

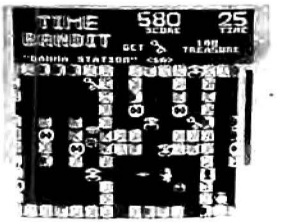
Tired of games that have only a few screens or force you to follow a strict order of levels? In TIME BANDIT, you virtually create you own game! You can choose from more than TWENTY places during the entire game, and each place has more than 15 distinct variations and levels of difficulty; this means over 300 variations in all! You can use the TIMEGATES to travel to three different Worlds of Time, each one containing a multitude of colorful and unique adventuring areas. Visit FANTASY WORLD, WESTERN WORLD, or SPACE WORLD. Avoid or destroy the Evil Guardians: the Watching Lurker, Angry Elmo, Killer Smurphs, and lots more! Find the keys which remove various locks preventing your escape. But hurry Bandit — your power is dwindling and time is fleeting! This new machine language game is so exciting, challenging, and fun that you need never leave your home to find an arcade again! Ultra crisp Supergraphics that include colorful scrolling landscapes and full animation of a multitude of characters, amazing sound, and literally HUNDREDS of screens - it's all here! The conquest of time and space awaits you...



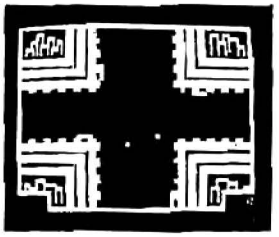
FANTASY WORLD: Conquer the halls of Doom, the Mystic Maze, the Underworld Arena, and other medieval places.

WESTERN WORLD: Visit the Lost Maverick Mine, Dead Man's Pass, (Visit? Escape!) Tombstone Jail, and many more!





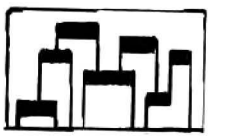
SPACE WORLD: Explore Hyperspace, the bizarre Light Barriers, the Insidious Grid, Gamma Station, the Enterprise and others!



STRONGHOLD

The war was short! Missles were launched, bombs exploded, and civilization was almost entirely whiped out. Only a handful of men remained to help rebuild what was lost. These handful seperated into four different civilizations, each building their own city and shielding it from the radioactive debris that fill the atmosphere. Now the debris has threatened to break up the shielding and destroy civilizations last remainents.

One or two player action with sound and split second graphics. Thats STRONGHOLD, try it and you'll enjoy it!



COMPUTER SHACK

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Info: **(313) 673-1205** ● Orders: **CALL TOLL FREE (800) 392-8881**

Master Charge and VISA OK. Please add $3.00 for shipping in the U.S.A. - $5.00 for Canada. Dealers Inquires Invited.

CU 135

```
2540 DATA "G","BM+1,-0;H1;U4;E1;
R2;F1;BM+0,+2;NL1;D2;G1;L2;BM+6,
+0"
2550 DATA "H","U3;NU3;R4;NU3;D3;
BM+3,0"
2560 DATA "I","BM+1,0;R1;NR1;U6;
NL1;R1;BM+4,+6"
2570 DATA "J","BM+0,-1;F1;R1;E1U
5;NL1;R1;BM+3,6"
2580 DATA "K","U3;NU3;R1;NE3;F3;
BM+3,0"
2590 DATA "L","NU6;R4;U1;BM+3,+1
"
2600 DATA "M","U6;F2;ND1;E2;D6;B
M+3,0"
2610 DATA "N","U6;F1;D1;F2;D1;F1
;NU6;BM+3,0"
2620 DATA "O","BM+1,0;H1;U4;E1;R
2;F1;D4;G1;L2;BM+6,0"
2630 DATA "P","U6;R3;F1;D1;G1;L3
;BM+7,3"
2640 DATA "Q","BM+1,0;H1;U4;E1;R
2;F1;D3;G1;NH1;NF1;G1;L1;BM+6,0"
2650 DATA "R","U6;R3;F1;D1;G1;L2
;NL1;F3;BM+3,0"
2660 DATA "S","BM+0,-1;F1;R2;E1;
U1;H1;L2;H1;U1;E1;R2;F1;BM+3,+5"
2670 DATA "T","BM+2,0;U6;NL2;R2;
BM+3,+6"
```

```
##########################################
#                                        #
#              KEEP TEXT  II             #
#                                        #
#      A SIMPLE, POWERFUL WORD PROCESSOR FOR CoCo      #
#                                        #
#    -FULL SCREEN, "CUT & PASTE" STYLE EDITOR.
#    -DRIVES ANY PRINTER, WITH DYNAMIC CONTROL CODES.
#    -RUNS IN 16K, 32K OR 64K.   -53K AVAILABLE IN 64K.
#    -UNDERLINE AND DOUBLE STRIKE ON ANY PRINTER.
#    -MENU DRIVEN,  WITH BUILT-IN TEACH SCREENS.
#    -BOTH CASSETTE AND DISK I/O IN ONE PROGRAM.
#    -SCREEN SIZE IS STANDARD 32x16 FOR READING EASE.
#    -BRIGHT CHARACTERS DISPLAYED ON BLACK BACKGROUND.
#    -RAGGED OR FLUSH RIGHT, UNDER USER CONTROL.
#    -GLOBAL SEARCH, WITH OPTIONAL CHANGE.
#    -FAST MACHINE LANGUAGE.      -BAUD RATES TO 9600.
#    -SINGLE OR DOUBLE SPACE PRINT AT ANY TIME.
#    -AUTOMATICALLY GENERATES ASCII FORMAT FILES.
#    -CASSETTE MOTOR CONTROL FROM MAIN MENU.
#    -MULTI-LINE PAGE HEADINGS AND FOOTERS.
#    -COLUMNAR AND PARAGRAPH STYLE PRINTING.
#    -AUTOMATIC KEY REPEAT.  -AUTOMATIC LINE CENTERING.
#    -ALL MARGINS AND PAGE LENGTH UNDER USER CONTROL.
#    -AUTOMATIC OR MANUAL PAGINATION.
#    -PAGE PAUSE, TO FEED SINGLE SHEETS, OPTIONAL.
#    -AUTOMATIC PAGE NUMBERING  AT USER OPTION.
#                                        #
#  THE "BASIC" VERSION OF KEEPTEXT  WAS  PUBLISHED  BY
#  CHROMASETTE  IN  JANUARY '83. THE NEW VERSION IS AN
#  ENHANCED MACHINE LANGUAGE  PROGRAM.   THIS  AD  WAS
#  PRODUCED BY KEEPTEXT II. THE PROGRAM COMES ON TAPE,
#  BUT IS EASILY COPIED TO DISK.  FOR QUICK  DELIVERY,
#  SEND $29.95, CHECK OR MO TO:
#                                        #
#      P & M SOFTWARE CO.                #
#      11600 S.W. FRWY, SUITE B-364      #
#      HOUSTON, TEXAS  77031             #
#                                        #
##########################################
```

RAINBOW CERTIFICATION SEAL

```
2680 DATA "U","BM+0,-1;NU5;F1;R2
;E1;U5;BM+3,6"
2690 DATA "V","BM+0,-6;D2;F1;D1;
F1;ND1;E1;U1;E1;U2;BM+3,+6"
2700 DATA "W","NU6;E2;NU1;F2;U6;
BM+3,6"
2710 DATA "X","U1;E4;U1;BM-4,0;D
1;F4;D1;BM+3,0"
2720 DATA "Y","BM+0,-6;D2;F2;ND2
;E2;U2;BM+3,6"
2730 DATA "Z","NR4;U1;E4;U1;L4;B
M+7,6"
2740 DATA "1","BM+1,0;R1;NR1;U6;
G1;BM+6,+5"
2750 DATA "2","NR4;U1;E1;R1;E2;U
1;H1;L2G1;BM+7,+5"
2760 DATA "3","BM+0,-1;F1;R2;E1;
H2;E2;H1;L3;BM+7,6"
2770 DATA "4","BM+3,0;U2;NR1;L3;
U1;E3;D3;BM+4,3"
2780 DATA "5","BM+0,-1;F1;R2;E1;
U2;H1;L3;U2;R4;BM+3,+6"
2790 DATA "6","BM+4,-5;H1;L2;G1;
D4;F1;R2;E1;U1;H1;L3;BM+7,+3"
2800 DATA "7","U1;E4;U1;L4;BM+7,
+6"
2810 DATA "8","BM+1,-0;H1;U1;E1;
H1;U1;E1;R2;F1;D1;G1;NL2;F1;D1;G
1;L2;BM+6,0"
2820 DATA "9","BM+0,-1;F1;R2;E1;
U4;H1;L2;G1;D1;F1;R2;BM+4,+3"
2830 DATA "/","U1;E4;U1;BM+3,6"
2840 DATA "?","BM+0,-5;E1;R2;F1;
D1;G2;BM+0,+1;D1;BM+5,+0"
2850 DATA "!","BM+2,+1;U1;BM+0,-
2;U5;BM+5,7"
2860 DATA ".","BM+2,0;U1;BM+5,+1
"
2870 DATA ":","BM+2,-1;U1;BM+0,-
2;U1;BM+5,+5"
2880 DATA ";","BM+1,0;E1;U1;BM+0
,-1;U1;BM+5,+4"
2890 DATA ",","BM+2,0;NU1;G1;BM+
6,-1"
2900 DATA "'","BM+1,-5;E2;BM+6,+
7"
2910 DATA "-","BM+0,-3;R4;BM+3,+
3"
2920 DATA "+","BM+2,-1;U2;NU2;NL
2;R2;BM+3,+3"
2930 DATA "=","BM+1,-2;R3;BM-3,-
2;R3;BM+4,+4"
3000 '** ILLEGAL REQUEST ROUTINE
3010 CLS0:SOUND10,10:PRINT@353,"
THIS BAND NOT AUTHORIZED FOR";:P
RINT@387,"THAT CLASS OPERATOR.";
:FORTM=1 TO1200:NEXT:CLS:GOTO110
```

- COMPUTER SHACK -

CIII

This program lets you copy a color computer disk file (any file basic, text or machine language) to a Model I/III or 4 disk or from a Model I/III or 4 to a color computer disk. This program does no conversions but it will transfer any file to or from a disk. You must have a Model I/III or 4 with 2 disk drives (Model I must be double density). Compatible with most Model I/III operating systems.

Price is $24.95 for the Model I/III or 4 disk.

DFTII

The best value in terminal programs. One of the easiest modem programs to use yet it can do things no other modem program can. It will transfer basic programs from a Model I/III to a Color Computer. Transfer machine language programs from one COCO to another COCO without any conversions. Chat mode, ASCII transmit and receive mode and much, much more.

Disk or Tape Now only $25.95

SMALL BUSINESS BILLING SYSTEM

Imagine having all your customers at your finger tips with the ability to print invoices or monthly bill easily and quickly. Now imagine being able to keep a running total of all customer accounts without having to even pick up a calculator. Its all automatic, just say so and it performs. You can access a customer file, print a invoice, add sales tax, shipping cost, interest, and even service charges with the simple ease of pushing a button. All at once you'll have time to get the important things done instead of constantly worrying about customer accounts. That's what you get with a BILLING SYSTEM. Computer Shacks Small Business Billing System, not an elaborate accounts receivable program, but a simple and effective way of keeping track of people who owe you money.

DISK ONLY..... $29.95

SUPER INPUT

Super Input is a machine language subroutine that you can add to your basic programs to make them look and run like they were written by a professional. This is a fantastic inkey routine that lets you input and edit your data routines. Say you are dealing with an address list and you type in a name, address, city and telephone number and you notice that you spelled the name wrong. All you do is hit the up arrow and go back to the name line ane type over the mistake. You can use the arrow keys to move all over the screen. When inputing information the curser will automatically go to the next input space. In other words you draw the screen and then go back to the top for data input. Like the fancy machine language programs do. Four versions available. Model I/III 4 mode / Coco .... $19.95@

DOUBLE DENSITY DISKS ONLY $1.75@

At Computer Shack we buy thousands of disk a month for our own use. We have found that we can save considerable sums of money by buying disks in bulk. That is 100 disks in a box with no sleeves, no labels etc. We can put 10 disks in vinyl sleeves and a plastic box for less money than we can buy the same disks we buy in bulk in a paper box! So we do this and pass the savings on to you.

The disks we buy are outstanding! We unconditionally guarantee them for the life of your computer. If you ever have a problem with them return them to us and we will give you a refund of exchange them for new ones within 24 hours.

100 disks with tyvek sleeves..... $175.00
10 disks with tyvek sleeves..... $19.95
10 disks with vinyl sleeves $21.95
Disks with vinyl sleeves and plastic library box $23.95

Small Business & Personal Check Writer

This easy to use powerful utility, will take the tedium out of the time consuming task of writing checks, keeping records, and balancing you account. With 99 categories of expenses, the program will sort in seconds on check #, amount, budget #, payee or date.

Great for businesses who need accurate and easily accessible records. The printer program is written in basic for easy modification, while data entry and sorting are done through machine language subroutines.

Designed to be used with NEBS preprinted checks, the Check may also be modified to work with any kind of preprinted checks. Many different printouts are available for all your records.

Disk only $49.95

SUPERZAP

An amazing new program for the serious Color computer disk user. This program allows the user full access to all of the information on any disk. With 17 menu options, this user-friendly program takes you step by step through the functions it performs.

SUPERZAP has a main screen menu that tells you all the options and their corresponding keys. All you do is decide what you need done and the program does the rest. Disk backups, copy sectors, erase tracks, granule maps, kill and list files, modify sectors in HEX or ASCII, and more!

No more lost time because of disk problems. SUPERZAP can do it! The ultimate in disk repair and information retieval. No color computer disk operator should be without it.

DISK ONLY..... $29.95



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CU 135



Christmas Printer Mysteries

This is the second installment in a continuing series of short 'Printer Mysteries' which began in November.

By Michael J. Himowitz and Julius Nelson

Here are two little Christmas printer mysteries for those of you who have the *Printer Artist* program from the November issue of *the Rainbow*. To use them, run the program and enter the characters below, line by line. For example, 5: means strike the colon five times. 25$ means strike the "$" key 25 times. 10sp means strike the space bar 10 times. Consult the instructions with the program. We won't tell you what they are because that would spoil the fun.

For those interested in sophisticated printer art development, a complete "Printer Artist" system is available from Federal Hill Software, 825 William St., Baltimore, MD 21230.

Christmas Printer Mystery No. 1

```
LINE
  1  43:
  2  5: 1$ 7: 1$ 7: 1$ 7: 1$ 7: 1$ 5:
  3  4: 3$ 5: 3$ 5: 3$ 5: 3$ 5: 3$ 4:
  4  3: 5$ 3: 5$ 3: 5$ 3: 5$ 3: 5$ 3:
  5  2: 7$ 1: 7$ 1: 7$ 1: 7$ 1: 7$ 2:
  6  5: 1$ 7: 1$ 7: 1$ 7: 1$ 7: 1$ 5:
  7  Same as line 6
  8  43:
  9  5: 1$ 12: 2$ 3: 2$ 12: 1$ 5:
 10  4: 3$ 11: 3$ 2: 2$ 11: 3$ 4:
 11  3: 5$ 10: 2$ 1: 1$  1: 2$ 10: 5$ 3:
 12  2: 7$  9: 2$ 2: 3$  9: 7$ 2:
 13  5: 1$ 12: 2$ 3: 2$ 12: 1$ 5:
 14  5: 1$ 31: 1$ 5:
 15  43:
 16  5: 1$ 13: 5$ 13: 1$ 5:
 17  4: 3$ 11: 2$  3: 2$ 11: 3$ 4:
 18  3: 5$ 10: 2$  3: 2$ 10: 5$ 3:
 19  2: 7$  9: 2$  3: 2$  9: 7$ 2:
 20  5: 1$ 13: 5$ 13: 1$  5:
 21  Same as line 14
 22  43:
 23  5: 1$ 12: 7$ 12: 1$ 5:
 24  4: 3$ 11: 2$ 16: 3$ 4:
 25  3: 5$ 10: 4$ 13: 5$ 3:
 26  2: 7$  9: 2$ 14: 7$ 2:
 27  Same as line 23
 28  Same as line 14
 29  43:
 30  5: 1$ 12: 2$ 17: 1$ 5:
 31  4: 3$ 11: 2$ 16: 3$ 4:
 32  3: 5$ 10: 2$ 15: 5$ 3:
 33  2: 7$  9: 2$ 14: 7$ 2:
 34  5: 1$ 12: 7$ 12: 1$ 5:
 35  Same as line 14
 36  43:
 37  5: 1$ 7: 1$ 7: 1$ 7: 1$ 7: 1$ 5:
 38  4: 3$ 5: 3$ 5: 3$ 5: 3$ 5: 3$ 4:
 39  3: 5$ 3: 5$ 3: 5$ 3: 5$ 3: 5$ 3:
 40  2: 7$ 1: 7$ 1: 7$ 1: 7$ 1: 7$ 2:
 41  5: 1$ 7: 1$ 7: 1$ 7: 1$ 7: 1$ 5:
 42  Same as line 41
 43  43:
```

Christmas Printer Mystery No. 2

```
LINE
  1  4: 22sp 4:
  2  4sp 3: 16sp 3:
  3  7sp 3: 3sp 4I 3sp 3:
  4  10sp 3: 4I 3:
  5  13sp 4I
  6  10sp 10M
  7  7sp 16M
  8  5sp 20M
  9  4sp 22M
 10  3sp 24I
 11  2sp 26I
 12  1sp 28I
 13  30M
 14  30M
 15  30M
 16  30I
 17  30I
 18  30I
 19  30M
 20  30M
 21  30M
 22  1sp 28I
 23  2sp 26I
 24  3sp 24I
 25  4sp 22M
 26  6sp 18M
 27  8sp 14M
 28  11sp 8M
 29  13sp 4M
```

(Michael Himowitz is a Washington correspondent for the Baltimore Evening Sun and proprietor of Federal Hill Software. He lives in Baltimore with his wife, two children, a color computer and a gemini printer. He loves them in that order.)

- COMPUTER SHACK -

It hardly seems like it, as I sit here writing this, but by the time you read this it will be time to think about ordering your programs for Christmas. Cashman, our #1 game this month, took Bill Dunlevy and Doug Frayer almost 6 months to write so I figured it would be a while before I saw a new game from their shop. But Bill surprised me by teaming up with Harry Lafnear and converting Time Bandit from the Model I/III to the Color Computer. Only thing I can say is WOW! Its better than Great! At the time I could honestly say the CASHMAN was the most impressive game written for the COCO. With maybe Zaxxon giving it a slight fight for the top. But now I have to add Time Bandit to these two classics. These games are the ultimate in graphics and action: the likes of which have never been seen before on the Color Computer! Or, for that matter, on any home computer! (It's time to put Atari users in their place!). If you are a kid tell your MOMMY what games you want from Computer Shack. If you are a MOMMY call today and order your families' great gifts. **Computer Shack carries the best programs from all the leading manufacturers!**

BALLOON ATTACK

Look up in the sky! Its a bird, its a plane, its a... Balloon? Yes, its Computer Shacks Balloon Attack! Avoid the mass of bombs dropping from the balloon. Along with each copy of the game we include a complete commented source code listing of the game. This is really great if you want to learn how to program a game in machine language. 16K TAPE/DISK ..... $21.95/$23.95

DEMON SEED

The demonic forces are back again.. and this time there's no escape. From every direction the alien Demons and their hideous bats are attacking. Save the earth by fighting your way through waves of furious bats and demons in order to meet and destroy the great demon FLAG-SHIP. Exciting color and fast action graphics. Three explosive color screen's and three unbeatable challenge rounds make this a great game that your won 't want to miss. 16K/32K Tape $27.95/$29.95

GREYMOON

When you first came to the city-state of Greymoon, it was small with few people and little wealth. Now you must try to make Greymoon the most powerful state in the land (and yourself king!) Every year one of several different events will test your ability as a ruler, if you are able to meet these challenges and your country grows and prospers, then so will your rank, but if you fail and your people starve, then your term as a ruler could be very short!

16K Tape.... $19.95 Disk.... $21.95

OUTHOUSE

Outhouse is one of the funniest most original games ever made for the Color Computer. Martin Goodman In Hot Coco says "I was totally taken by its originality, its outstanding graphics, its delightful sound effects, and, most of all, by its brilliant playability. You control a spaceship that guards the outhouse. You zap away at quite amusing thieves who will enter the outhouse, drag out the toilet paper, and proceed to string it across the screen unless you stop them. I urge all COCO arcade players to purchase this game. It really is one of the very best I've seen". 16K/32K TAPE..... $26.95 DISK..... $28.95

C.S. TOP TEN FOR NOVEMBER

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6	7	Outhouse	C.S.
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Unlock Your Joyports And Open CoCo To The World

By Dane Weston

A little hardware modification can unleash endless possibilities by bringing the Coco's analog-to-digital converter into contact with your imagination.

As many hardware hackers have discovered, one of the advantages of owning a Color Computer is the true analog-to-digital joystick ports. For the experienced hardware experimenter, it is a simple matter to use the joyports to bring external sensor data into the CoCo. These sensors can measure things like light intensity, humidity, temperature, proximity, position and others — basically they can be any device that measures some quantity in terms of varying electrical resistance. On most other micros, the analog-to-digital converter that provides this capability is a fairly expensive add-on. Since this capability came with your CoCo, and since it is a powerful tool, it's something that you should explore — and you don't have to be a hardware wizard to get started!

There are two approaches to hooking some external sensor to the joystick port. The first is to build an interface cable from the sensor or sensors to the joyport. Those of us with an established electronic workbench and parts supply (including the joyport connector) might choose this approach, but many of the rest of us might shy away from a hardware project built totally from scratch. The second approach is to modify the joystick so that the external sensor can plug right in, the way an earphone plugs into a transistor radio. This is a cheaper way to go, uses readily available parts, and doesn't leave another box lying around your workstation. Since joyport expansion articles for the hardware hacker are available in past issues of *the Rainbow* and other magazines, this article will address the joystick modification approach, hopefully clearly and simply enough to convince you to give it a shot even if you've never held a soldering iron before. (Game freaks, don't despair. The mod will not affect normal operation of your joysticks.)

If you've explored the *JOYSTK* function in any of your programs, you know that the statement

A = JOYSTK (x) (x = 0,1,2, or 3)

returns a value for A between 0 and 63, depending on the position of the stick. Details of precisely how this is done are available in the "Color Computer Technical Reference Manual." It is enough here to say that moving the joystick changes the ratio of two resistances inside, resulting in a change in voltage which the CoCo circuitry and firmware translate to a number between 0 and 63. The key is the changing resistance ratio. We can achieve the same effect by holding the joystick resistances constant (by not moving the stick) and adding the variable resistance of some sensor (like a photocell, a moisture detector, or some other device). The numbers the *JOYSTK* function will produce when we do this may vary only in some subset of the 0 to 63 range (for instance, from 20 to 35), but the important point is that they will vary — with fair consistency — as a function of the conditions sensed by our external device change, whether from darkness to light, from dry to wet, or whatever. This opens up a whole world of fun things you and your 80C can do.

Getting Ready

The goal of the modification instructions below is to help you install an earphone jack in one of your joysticks. You will need the parts, supplies, and tools shown below. Radio Shack part numbers are given as a reference; similar parts from other sources should work just as well. If you don't have a soldering iron or the other tools, borrow them from a friend. Make sure you have a small iron — 30 watts, or so — and rosin core solder. Those 300-watt hoglegs and acid-core solder are for repairing gutters, not computers. Please note that the parts listed below are those required to install, test, and demonstrate the modification. Parts for some suggested external sensors are listed later in this article.

Parts	Radio Shack Number	Estimated Cost
2-Conductor 3/32" Subminiature Phone Jacks	274-292	2/ $1.19
2-Conductor Speaker Wire (100ft/AWG 22 Standard)	278-1385	$4.59
2-Conductor 3/32" (Subminiature Phone Plugs)	274-289	2/ $ .99
Miniature Alligator Clips	270-378	10/ $1.29
Cadmium Sulfide Photocell	276-116	$1.29

(Maj. Dane Weston is a communications officer in the U.S. Air Force who enjoys "tinkering with the hardware and programming power" of the 80C. He holds a master's degree in command and control systems technology and has been an avid CoCo hacker for four years.)

Tools And Supplies

30-watt Soldering Pencil	6" Diagonal Cutters
Rosin-Core Solder	Medium Phillips Screwdriver
6" Needle-Nose Pliers	Electric Drill with $^5/_{32}$" Bit

Also note that you don't absolutely need the speaker wire — any medium gauge stranded hookup wire will work. Speaker wire is referred to here because the runs to the external sensor are two-wire, and speaker wire is a neat way to do that. Further, you may find that you want to place sensors some distance from your computer, and that can quickly use up the remaining 95 feet of your hundred-foot roll.

Before you rip your joystick open, make sure you're comfortable using the tools you have. You should be able to clip a wire to any desired length (piece of cake) and strip off a given amount of insulation from the end (not so easy until you get the hang of it). To strip insulation, try partially closing the cutting jaws of the pliers (for me, diagonals are better than needle-nose for this) on the spot where you want the insulation to stop. Hold the wire close to this spot with your other hand and pull the pliers toward the end of the wire. When you do this right, the jaws will cut the insulation and pull it right off without damaging the conductor. If you're the slightest bit unsure about how well you can handle the pliers, don't read this. Chop off a length of speaker wire, split it down the middle, and cut and strip until you're comfortable with your abilities.

Now for the soldering iron. There is nothing magic about a good solder joint, but, like anything else, it takes a little practice. The main trick to learn is that you heat the work, then apply the solder. Simple? Yes, but if you get the joint too hot — or not hot enough — you won't get a good ohmic contract. Practice is the key, so plug that iron in and fumble around.

Let me pass on a few hints. First, don't work on your mother's antique cherry table. Hot irons, flux and solder can leave little marks that get you in big trouble. Next, treat the iron with respect, but don't be afraid of it. It may give you a little blister, but it won't take your hand off. (I've been a hardware hacker for twenty-some years and have branded my fingers many times — you can't see a single scar.) Once you get the iron hot, keep the tip clean and tinned. You can clean the tip by brushing it on a damp sponge; tin it by melting a bit of solder on it — brush the excess on the sponge. Repeat this little ritual every so often while you are working with the iron. (If the tip is really cruddy, clean it up with a file or sandpaper before you plug it in. That layer of oxides prevents good heat transfer and can make an easy job a miserable experience.) Next, insure that the leads you are joining form a good mechanical connection. If the leads move while the solder is cooling, you'll get a dull, almost whitish joint that is poor mechanically and electrically. (Try it and see.) A good ohmic joint is shiny bright after it cools. (An ohmic joint forms a low resistance that conducts electric current well in both directions. A poor joint may conduct well in only one direction — one of these can make an otherwise perfect hardware project go bananas.) If you're soldering two wires, twist them together into a neat package first, then heat the joint and apply the solder at the junction of the joint and the iron. Once the solder flows over the joint, remove both the solder and the iron, and let the joint cool without moving any of the leads. Then clip any excess leads.

Don't use too much solder. If you leave a big silver blob on the joint, take some of the excess off with a clean iron (use the sponge, remember?) from underneath the joint, and brush it off on the sponge. Well, that's it. Keep your tip clean, make good mechanical connections, and practice until you get the hang of it.

The Modification

Once you have your parts and tools assembled, grab a joystick, spread everything out comfortably on your workspace (not Mom's antique table) and plug in your iron. Don't worry that the iron is sitting there cooking while you are doing something else; it won't get hurt. *Do* take care that it is positioned away from its power cord, the joystick cable, and your own delicate flesh — they can get hurt. Okay, here we go.

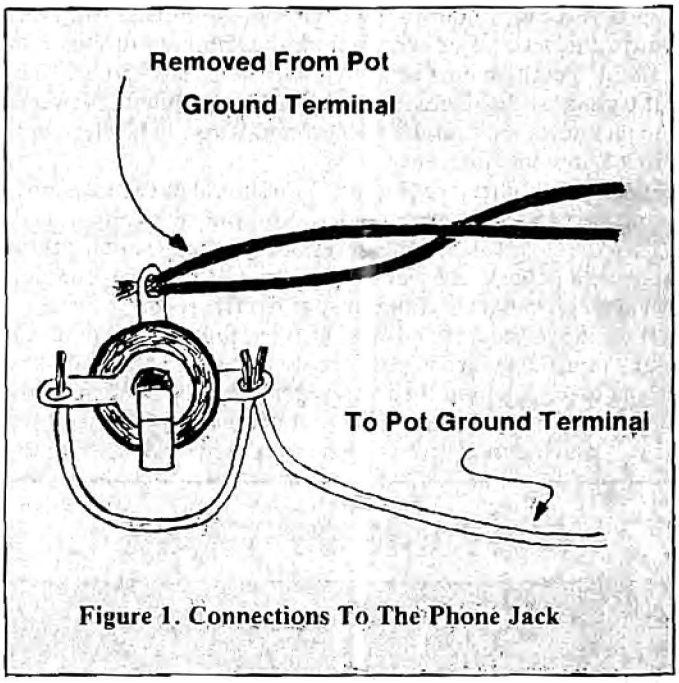


Figure 1. Connections To The Phone Jack

1) Using the Phillips screwdriver, remove the screws on the bottom of the joystick. Turn the case over and remove the top. Notice how the fire-button, potentiometer assembly, and cable fit in the case.

2) Remove everything from the bottom half of the case. Using light pressure on the bit (don't crack the case), drill a $^5/_{32}$" hole on the right side of the case bottom half, centered between the top and bottom edges, ¾" from the front of the case. Put the case aside for now.

3) Cut a 1½" and a 4" piece of hookup wire. Strip ¼" of insulation from both ends of each wire. (If you're using speaker wire, chop off a 4" piece and split it first.) Twist the strands of the wire together to form neat ends.

4) Look at the back of a subminiature phone jack. You should see three eyelet solder terminals. Thread the ends of the 1½" wire through the two terminals that are opposite each other. Solder one end in place (bend it over with the needle-nose first — remember your mechanical joint) and trim the excess. Thread one end of the 4" wire in with the other end of the 1½" wire (that's right, both in the same terminal), solder them down and trim any excess lead.

5) Identify the potentiometer opposite the fire button. (The potentiometers — nicknamed "pots" — are those two little squat cylinders with three terminals each at the base of

the joystick. More about what they do in a bit.) You may have to fit everything back into the bottom half of the case to be sure about this. This pot is the one that controls the JOYSTK(0) values in the CoCo. Now find the ground leads on this pot. This should be two wires, at least one of them black, but double-check it as follows. Look at the fire button. One wire goes directly to the joystick cable. The *other* wire goes daisy-chain to the ground terminals on the pots; follow this one round to the terminal on the JOYSTK(0) pot. Remove the two wires from this terminal — just head the joint until the solder flows and slip the wires out. (Burn your fingers yet?)

6) Solder the free end of the 4" wire into this terminal. If the eyelet is full of solder, heat it first, then push the wire end through. Bend the wire over, solder it down (just a little fresh solder), and trim the excess.

7) If you can, solder the two wires you removed from the pot to the yet unused terminal on the subminiature jack. I couldn't get them both to fit in that little eyelet (and broke it off trying), so I soldered a 1" piece of hookup wire between the jack terminal and the two ground wires. (The electrons don't know the difference.)

8) Carefully check your work. You should have nice, shiny joints without too much solder. No joint or exposed lead should be close to any other terminal. Check the pot for this, and triple-check the jack. Any metal-to-metal contact between terminals is going to spoil your efforts.

9) Remove the nut and washer from the jack. Mount the jack in the hole you drilled. (The washer goes on the outside of the case.) Tighten the nut snugly (don't be brutish) with the needle-nose. Reseat the fire button and pot assembly, and replace those screws that secure the pot assembly. (Some joysticks may not have these.)

10) Insert a subminiature plug in the jack. It should snap in cleanly, like the earphone on a transistor radio. Check the jack again to make sure that none of the terminal connections short against the plug. If everything looks good, replace the case top and the remaining screws.

11) Remove the plug from the jack. Unscrew the plastic top of the plug. (If you use the needle-nose to hold the tip while you do this, take care — you may slightly flatten the tip and it won't work right.) Slide the top smaller-end-first onto a 5-foot piece of speaker wire. Split the end of the wire up about 1", tie the ends in an overhand knot, and strip ¼" insulation off both wires. Solder these to the plug terminals. Wrap the smaller, inside terminal with tape (not too much) to keep the terminals from touching when you replace the top. Slide the top down the wire and screw it back onto the plug.

12) Split the other end of the wire about 3", strip off ¼" insulation from each conductor, and tie an overhand knot with the ends. Remove the plastic cover from an alligator clip by clamping the jaws wide open on something, then slipping the plastic off the back. Slip the cover small-end-first over one of the wires and solder the wire to the clip. (Your mechanical connection is especially important here. Bend those little tabs down tightly over the wire.) Watch your fingers — you'll find you need more heat for this joint. After the joint cools (once you get a good one) clamp the jaws open again and slide the plastic cover back on the clip. Repeat this process with a clip of the same color on the other wire.

Testing the Mod

That's all there is to it. Now let's test it and see whether it works. (Mine didn't the first time through.) Connect the modified joystick to the "Right Joystick" connector on your CoCo, power up and enter this program:

```
10 Print JOYSTK(0)
20 For T = 1 to 200: Next T
30 GO TO 10
```

This will display the port 0 value at a rate where we can see it. With the sensor cable not plugged in the jack, run the program. As you slowly move the stick from left to right, the values should range smoothly from 0 (far left) to 63 (far right). This means the stick is functioning normally. If you don't get this, you probably have one of two problems. If the joyport values change sometimes as you move the cable but not the stick, you probably have a broken wire in the cable. This is not unusual among avid CoCo gamesters — one of my sticks was this way. (Until it bothered me enough to warrant rebuilding the cable, my lazy-man solution was bending the cable until the stick worked properly, then taping a loop in the cable to hold it that way.) If a broken wire doesn't appear to be the problem, unplug the joystick and open it up. Check for wires touching that shouldn't be, or loose bits of wire or solder. If that doesn't help, go back and reread the instructions. I did my best, but maybe I confused you on what wires go where.

Once you have confirmed normal function of the joystick, plug in the sensor cable and run the program above. When the two alligator clips are clipped together, you should get normal stick function. When the clips are not touching, you should get all 63s. If you don't, check the fingers on the jack. The end of the plug should go in all the way (past the jack sleeve) and should separate the two finger contacts. Also, check the plug itself to make sure you haven't flattened or bent it.

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If your mod passes these tests, you should be ready for the big time. Plug in the sensor cable and connect one alligator clip to each lead of the cadmium sulfide photocell. Center the joystick for now. As you point the photocell at lighter or darker areas of the room, you should get lower or higher joyport values. (All values should be greater than or equal to the value you get without the sensor plugged in.) If you get this variation, you're in business. Congratulations!

A Little Theory

Now move the stick. Notice that it still changes the joyport values. Move it to the far right. You should get all 63s, and the amount of light on the photocell should make no difference. Now move the stick to the far left. You may be able to get a value as low as 0, and the amount of light on the photocell should produce a wide range of joyport values. How does all this tie together? Read on.

Let's first take the case of the joystick potentiometer by itself. The pot is in fact a 100K resistor (the K stands for kilohms — 1000 ohms — so 100K is 100,000 ohms) between the two outside terminals, with a wiper connected to the middle terminal. The wiper lets you split that 100K into any two resistances that sum to 100K — say 50K and 50K, 30K and 70K, 0K and 100K, etc. Let's call these resistances R1 and R2, as in Figure 2. The joyport value the CoCo returns as you move the stick and choose an R1 and R2 is pretty closely

$$N = INT (63 * R2/(R1 + R2))$$

Thus, if the wiper is all the way to the top, R1 = 0, R2 = 100K, and N = 63. For all the way down, R1 = 100K, R2 = 0, and N = 0. Halfway in between, R1 = 50K, R2 = 50K, and N = 31. You'll find it useful to plug these values in the equation above and verify these results. Got the hang of it?

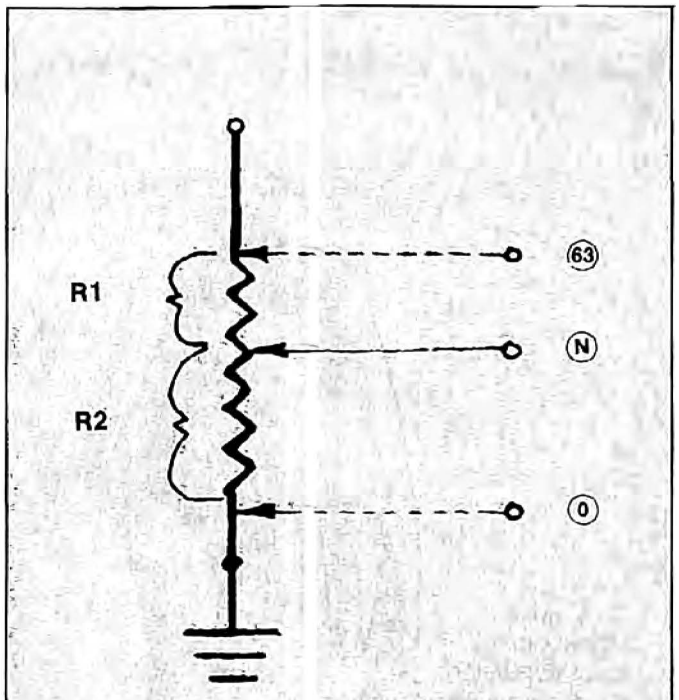


Figure 2. The Normal Joystick

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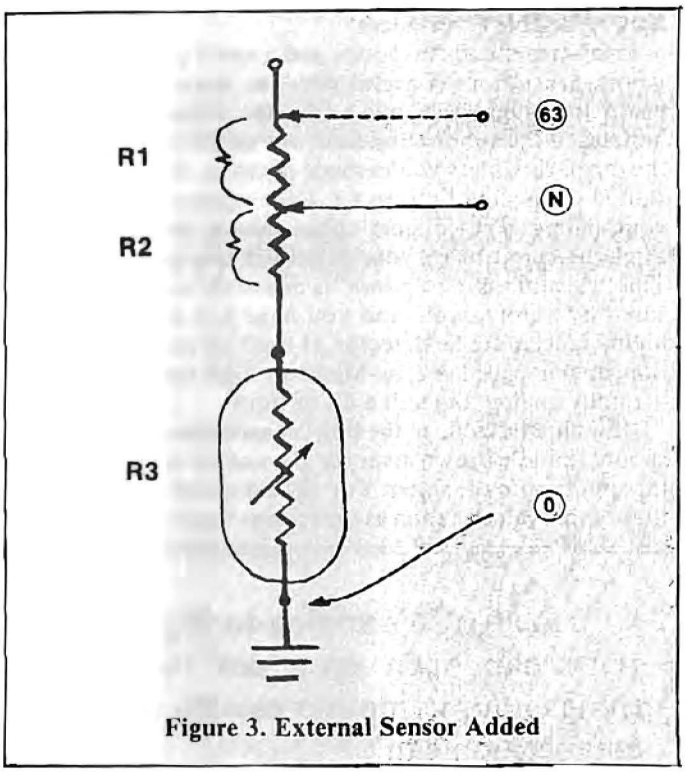


Figure 3. External Sensor Added

Now let's add the variable resistance sensor, shown as R3 in Figure 3. The joyport value CoCo returns in this case is given by

$$N = INT (63 * (R2 + R3)/(R1 + R2 + R3))$$

In effect, everything works the same way, except the sensor resistance is added to the lower part of the pot resistance. Check the specifications on the back of the photocell package. The cell resistance should vary between a few kilohms in bright light to a minimum of one-half megohm (500,000 ohms, or 500K) in the dark. Place the joystick to the far left (R1 = 100K, R2 = 0) and see what values you get for bright light and darkness. How do these compare with what you expected? (My photocell produced values from 0 to 63.)

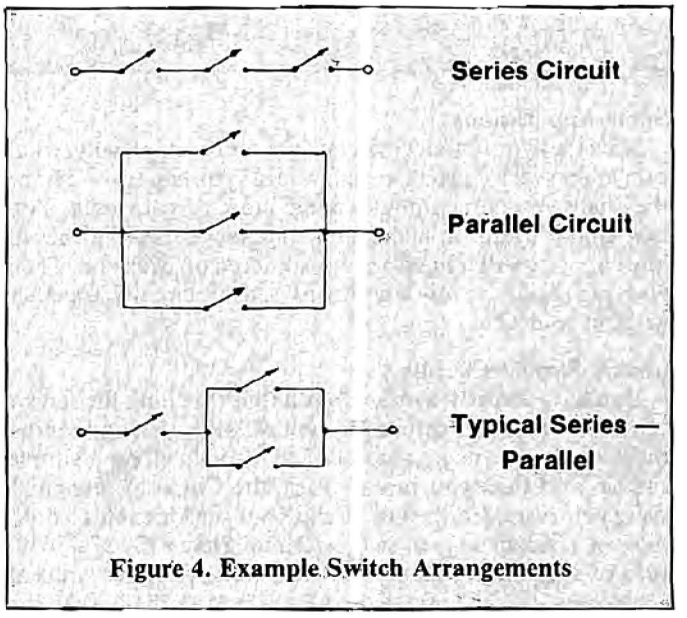


Figure 4. Example Switch Arrangements

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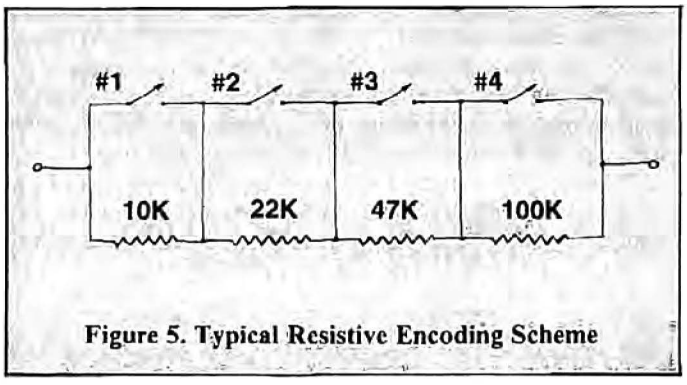


Figure 5. Typical Resistive Encoding Scheme

Some Applications

Now that your mod works and you understand why, what can you do with it? Here are a few ideas you can try — I hope they help you come up with some more of your own. You may find it useful to make some jumpers from 8" pieces of hookup wire with alligator cups soldered on each end. Then you can hook multi-component sensor circuits together without soldering.

Switch Closure Circuits

You have already demonstrated that touching the sensor cable clips together returns a joyport value of 0, and taking them apart returns a value of 63. This is in effect a simple switch, and thus you can now use the CoCo to recognize switch closures. For instance, clip your sensor cable to both sides of a magnetic reed switch (Radio Shack PN 275-1610, 10/$1.98). Since the reeds aren't touching, you get a value of 63. Now bring a magnet (R.S. PN 64-1875/$.18) close to the switch. Once the magnetic field pulls the reeds together, you get a value of 0. If you like, you can daisy-chain several reed switches together with your jumpers — then all switches have to be close to a magnet to get a value of 0. Or you can hook several switches in parallel (each one connected to both sensor clips) — then any single switch closed will drive the joyport to 0. Remember to move the joystick all the way to the left, or you'll get a value other than 0.

Another fun switch is the mercury switch (R.S. PN 275-025/$.89). What closes the switch contacts here is a tiny bit of the liquid metal mercury. Clip one of these to your sensor cable, and move the switch around. You should find a relatively small range of positions that return a value of 0. Like the reed switches, the mercury switches can be hooked up in series, or parallel, or in series-parallel combinations; and they can be mixed with reed switches or others.

Suppose you want to know how many of several sensor switches are closed, or perhaps even which specific switches are closed. No problem — just add some variable resistance scheme to the switches. Figure 5 shows one way to do this. Notice that the resistance values increase roughly geometrically (1, 2, 4, 8 . . .); in this manner any combination of open and closed switches produces a unique total resistance, and thus a unique joyport value that your software can interpret. For instance, all switches open gives a sensor resistance of 179K. Switch 1 closed gives 169K, switches 1 and 3 closed gives 122K, and so forth. A good way to experiment with this idea is to solder the ends of each resistor to the ends of a reed switch (one resistor across each switch), then hook up the resulting "coded" switches with jumpers as you did before. Does it work as you expected? Does the order of the switches matter? I hope you're beginning to see some of the power and versatility of your joyports.

Other Variable Resistances

Bring two metal teaspoons and a small glass of water to your workstation. (Careful with the water — it's instant death to things electronic.) Clip the sensor cable to the handles of the spoons and hold one spoon in each hand by the big part. Unless you're made of stone, the joyport value should drop slightly from 63. Now squeeze the spoons in your palms. The joyport value should drop noticeably. Slight perspiration on your palms will also produce a drop. This "galvanic skin response" is one of the parameters measured by a polygraph, and you have just made your own highly inaccurate lie detector. (I built an interesting variation of this called a Kiss-Meter in high school years ago —totally analog, but still a lot of fun.)

Now clip the cable to the bowl of each spoon and hold the spoons, handles down, over the glass of water. Slowly lower the spoons into the water. You should notice a large drop in the joyport value as soon as the spoons touch the water. You have just invented the CoCo moisture detector. Also, I found that I could estimate the depth of the spoons by the continuing decrease in the joyport value as the spoons went deeper.

> "... the CoCo's analog-to-digital joyports can open up a new world of things your computer can do that the competition can't."

Conclusion

There are many, many other sensors to talk about, but no room left to discuss them here. That's okay — this article was written to whet your appetite, not catalog what's available. The whole point is that the CoCo's analog-to-digital joyports can open up a new world of things your computer can do that the competition can't. Imagine kids' games with novel input devices — not just joysticks. Imagine some of the educational or low-cost laboratory applications. Or the household uses. The possibilities go on and on — and for all of us, not just the hardware wizards.

You've noticed that there is no applications hardware or software in this article. That was by careful design. The intent is to entice a very large number of *the Rainbow* family to attempt the joystick mod, to equip them with a little basic theory, and then to stand back and watch the flowers grow. If you've waded through this article, then here is my challenge to you. Modify your joystick. Then experiment around. (Please — only variable resistances. No batteries or external power supplies unless you *really* know what you're doing.) When you come up with something neat, send it in to *the Rainbow* and share it with the rest of us. If one joyport isn't enough for your application, add another jack, connected to the other pot. You'll have the parts right there, and it will be just as easy for the rest of us to add another one, too, so we can enjoy your work. And, if you have a proposed application but no solution, send it in and let us hardware hackers take a shot at it. I for one will be happy to help out.

Well, that's it. You're right; it will take some time and trouble to modify your joystick — especially if you've never soldered before. But you can do it, and you'll find it well worth your time and trouble. Knuckle down — and unlock your joyports!

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DISKSORT

By Matt Stephens

So you have just finished loading the last of your programs from your s-l-o-w cassette recorder to your new Radio Shack disk drive. Now you type 'DIR' to make sure that you didn't forget anything. As you look at the displayed filenames you wonder if you could somehow put those filenames in alphabetical order.

Enter *Disksort*. *Disksort* is a disk utility that will sort both your filenames and extensions in alphabetical order. It reads the filenames from the directory track, sorts them by filename and extension, and then writes the sorted directory back to the disk. Here's how it works:

When a filename is written to the disk, it is stored in a 16 byte block. This 16-byte block is composed of an eight-byte filename, a three-byte extension, a single byte that tells how the file was saved and two bytes that refer to the allocation table. Since these last two bytes go to an unchanged part of the directory an entire filename block can be moved around in the directory without harm. Separating each file block is another 16-byte block composed of zeros. That allows eight filenames per sector. *Disksort* reads the filenames one sector at a time and stops loading filenames when the first byte of a sector reads 255 (indicating that there are no more files). *Disksort* then proceeds to remove killed filenames (indicating by a zero in the first byte of the filename).

Now the filenames are removed from the strings that the sectors were saved on and can now be sorted by the CoCo. First the filenames are sorted using a Shell sort and then the filenames are sorted in their proper extension using a bubble sort. As written, *Disksort* will handle up to the maximum number of files that one disk will hold, which is 68. One caution should be observed: Say you have four filenames and they are numbers such as: 7, 8, 70, 80. They will be sorted in the following order: 7, 70, 8, 80. This is because *Disksort* handles the filenames as strings and "70" will come before "8."

Once the filenames are sorted, *Disksort* displays the filenames in the order that they will be saved to disk. You are then asked if you want the new directory saved to the disk. If you answer with anything other than "YES" the program will end and will not write the new directory. But if you do type "YES" then *Disksort* will write the new directory to the disk and execute a "DIR" to display your new, neat, *Disksorted* directory.

(Matt Stephens, 19, is a self-taught computer programmer and is currently studying electronics technology. He has been an avid user of the Color Computer since it was first introduced and is an active member of the Pittsburgh, Pa. Color Computer Users Group.)

70.....02AE
300.....0525
END...07DB

The listing:

```
1 '        <*DISKSORT*>
2 ' *>CREATED BY:
3 ' *>MATT STEPHENS
4 ' *>220 CRESTHAVEN LANE
5 ' *>PITTSBURGH,PA 15237
6 ' *>important:the author is
not responsible for any software
or hardwre failures due to the
use of this program.
7 ' *>if your'e not shure the
program will perform properly
then make a backup first.
(AN OUNCE OF PROTECTION IS WORTH
IT!!!)
10 PMODE0,1:PCLEAR1:CLEAR4500:DI
MS(68),A$(24),F$(68),E$(68):FC$=
STRING$(128,255):FF$=CHR$(255):A
=1:C=1
20 CLS:PRINT"disksort filename s
ort utility.":INPUT"INSERT DISK
TO BE SORTED AND    PRESS ENTER.
";Q$:CLS:PRINT"LOADING DIRECTORY
..."30 'READ FILENAMES
40 FORI=3TO12
50 DSKI$0,17,I,A$(A),A$(A+1)
60 IFLEFT$(A$(A+1),1)=FF$THEN80
70 A=A+2:NEXTI
80 Z=A:A=1:TR=I
90 'LOOK FOR END OF FILENAMES
100 FORX=1TO111STEP32
110 IFFF$>MID$(A$(A),X,1)THENS=S
+1:F$(S)=MID$(A$(A),X,16):NEXTX
ELSE120
120 IFMID$(A$(A+1),1,1)<FF$THENA
=A+1:GOTO100
130 'LOCATE KILLED FILES AND REM
OVE
140 FORX=1TOS
150 IFLEFT$(F$(X),1)=CHR$(0)THEN
170ELSENEXTX
```

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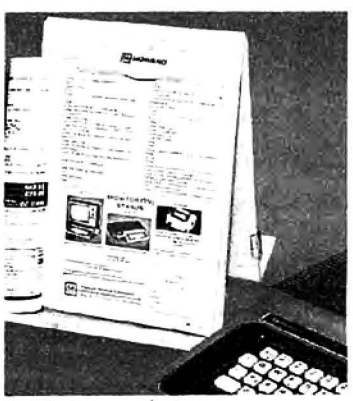
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```
160 GOTO180
170 FORI=X TOS:F$(I)=F$(I+1):NEX
TI:S=S-1:GOTO140
180 CLS:PRINT"SORTING...."
190 'SORT OUT EXTENSIONS
200 ZM=S:N=S
210 ZM=(.5+ZM/2):IFINT(ZM+.5)=1T
HEN270
220 M=INT(ZM):K=N-M
230 FORJ=1TOK:I=J
240 L=I+M
250 IFMID$(F$(I),9,3)>MID$(F$(L)
,9,3)THENS$=F$(I):F$(I)=F$(L):F$
(L)=S$:I=I-M:IFI>1THEN240
260 NEXTJ:GOTO210
270 FORX=1TOS:E$(X)=MID$(F$(X),9
,3):NEXTX
280 'SORT FILES IN EACH EXTENSIO
N
290 FORX=C TOS:IFE$(X)=E$(C)THEN
NEXTX
300 IFC=S THEN400
310 IFE$(C)<>E$(C+1)THENC=X:GOTO
290
320 X=X-1
330 FORA=C TOX-1
340 IFLEFT$(F$(A),8)>LEFT$(F$(A+
1),8)THENS$=F$(A):F$(A)=F$(A+1):
F$(A+1)=S$:FL=1
350 NEXTA
360 IFFL=1THENFL=0:GOTO330
370 IFS=X THEN400
380 C=X+1:GOTO290
390 'PRINT OUT FILENAMES
400 FORX=1TOS:PRINTLEFT$(F$(X),8
)"."E$(X):NEXTX
410 A=Z:Z=0:C=1
420 'REPLACE SORTED STRINGS TO B
E SAVED
430 FORX=1TO111STEP32
440 Z=Z+1:IFZ>S THEN480
450 MID$(A$(C),X,16)=F$(Z)
460 NEXTX
470 C=C+1:GOTO430
480 FORY=X TOLEN(A$(C)):MID$(A$(
C),Y,1)=FF$:NEXTY
490 C=C+1:IFC=>25THEN500ELSEIFLE
FT$(A$(C),1)<FF$THENA$(C)=FC$:GO
TO490
500 PRINT:PRINT"DIRECTORY FILENA
MES HAVE BEEN":INPUT"SORTED. ENT
ER 'YES' TO SAVE     SORTED DIRE
CTORY.";Q$:IFQ$<>"YES"THENCLS:EN
D
510 'WRITE NEW DIRECTORY TO DISK
520 A=1:VERIFYON
530 FORX=3TOTR
540 DSKO$0,17,X,A$(A),A$(A+1)
550 A=A+2:NEXTX
560 CLS:DIR
```



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These programs were written by a professional musician who teaches music and directs the band program at a college, so you can trust them to be educationally correct. That they are also fun to use is certainly a bonus. If you've always wanted to learn to read music, let your computer and the Music Reader join you. You'll be reading music like a pro before you know it!

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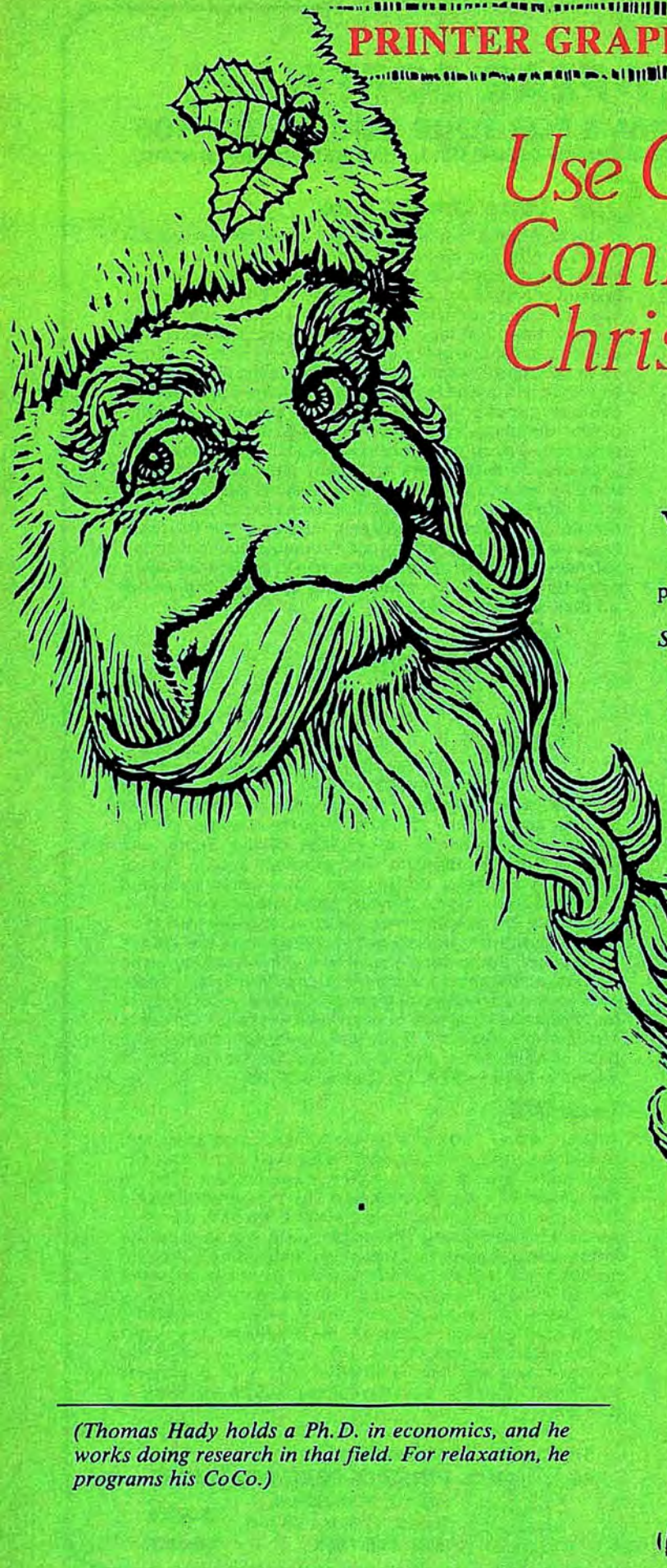
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the RAINBOW

Use CoCo To Help Communicate Those Christmas Greetings

By Tom Hady



Writers' cramp at Christmas? No time to work on your favorite computer because you're too busy writing notes on Christmas cards? Here are two programs that will relieve your holiday miseries!

The first program *Xmasltr* (Listing 1), lets you use *Color Scripsit* to prepare a standard paragraph that includes all the family news that you usually find yourself writing on every card. Then you compose individual paragraphs to each person on your list and put the paragraphs on cassette. Finally, the program merges your personal paragraphs with the "boilerplate" paragraph and prints the letters while you go and enjoy your eggnog.

If you don't want to send individual paragraphs, use the second program, *Stdltr*, (Listing 2). It automatically generates a short first paragraph which makes the letter sound less like a form letter, and then prints up to 50 letters while you bake cookies to go with the eggnog. It asks three questions about each recipient: name ("Dear -------"), possessive form of the last name, and the climate where the recipient lives. Then it prepares a letter which uses the recipient's name in the first paragraph and goes on to make an appropriate comment about the chances of a white Christmas in their location.

Xmasltr

Xmasltr actually is written to allow two different standard paragraphs. One, for example, can be from the husband and one from the wife (distinguished by who is referred to as "I") or one from

(Thomas Hady holds a Ph.D. in economics, and he works doing research in that field. For relaxation, he programs his CoCo.)

Mom and Dad and one from the kids. The first step is to compose these paragraphs in *Color Scripsit* and save them to tape. Use the print (main menu item 5) to tape (2) option, not the save on tape (3) option. Also, and this is very important, set the lines per page (under "standards," main menu item 6) to 132. Write down the name you give the *Scripsit* file. Repeat the process for the other paragraph, and record it right after the first.

Now, write your individual paragraphs. On the first line, put the number of the standard paragraph you want (1 or 2). If you forget this, don't worry. It defaults to paragraph two. The next line is "Dear So and So." On the next and succeeding lines, type your message. Then save it to cassette the same way you did before. Give all the individual paragraphs the file name "X" and save them one after another.

Next, *PCLEAR 1*, then load and run *Xmasltr*. The program is menu driven and should be easy to follow. First, load the standard paragraphs. Then, print your letters. There's no reason you have to read the personal paragraphs on the screen, but the option is there if you want it.

Stdltr

Running *Stdltr* is very similar to running *Xmasltr*, but you use *Scripsit* only for the standard paragraph. Compose that in *Scripsit* and save it as already described. Now *PCLEAR 1*, then load and *RUN Stdltr*. You don't have to, but I prefer to load the standard paragraph first (option 3 on the menu), then input information about your addresses. The screen will prompt you for what's needed. Finally, start the printer and relax.

One caution: Before you input 50 letters in either program, try it with five to make sure the letters start at the top of succeeding pages. If that's a problem (usually it's not), play with the constant TP in line 640 *(Xmasltr)* or 650 *(Stdltr)*.

Merry Christmas!

```
180.....0270
450.....0575
660....07CD
END...0ACF
```

Listing 1:

```
10 REM XMAS--XMAS LETTER GENERAT
OR
20 CLS:CLEAR 6000:LW=60:DIMP$(2)
,SP$(2,40):R=-1:L=-1:SP=3
30 PRINT @130, "HOW MANY STANDAR
D PARAGRAPHS?              (RANGE 1
TO 2)":INPUT SP
40 IF SP<1 OR SP>2 THEN  CLS:PRI
NT @32,"CAN'T HANDLE THAT NUMBER
":GOTO 30
50 CLS:PRINT @ 140, "MENU"
60 PRINT @ 192,"1. READ PERSONAL
 PARAGRAPHS ON       SCREEN"
70 PRINT @256,"2. INPUT STANDARD
 PARAGRAPHS"
80 PRINT @288, "3. PRINT LETTERS
"
90 PRINT @ 395, "YOUR CHOICE?"
100 S$=INKEY$:S=VAL(S$):IF S$=""
 THEN 100
110 IF S>4 THEN 50
120 ON S GOTO 140, 240, 530
130 REM READ FROM RECORDER
140 CLS:PRINT @256, "BE SURE REC
ORDER IS ON 'PLAY'":GOSUB 1020
150 OPEN "I", #-1, "X"
160 INPUT#-1,P$
170 PRINT P$
180 IF EOF (-1) THEN CLOSE #-1:G
OTO 200
190 GOTO 160
200 PRINT @ 488, "PRESS ANY KEY
TO RETURN TO MENU"
210 RY$=INKEY$:IF RY$="" THEN 21
0
220 GOTO 50
230 REM STANDARD PARAGRAPHS
240 CLS:PRINT @ 96, "BEFORE USIN
G THIS SECTION OF THEPROGRAM YOU
 SHOULD HAVE COMPOSEDYOUR STANDA
RD PARAGRAPHS IN"
250 PRINT "SCRIPSIT AND SAVED TH
EM  ON TAPE (USING THE PRINT<5>
TO TAPE<2> OPTION)"
260 PRINT @320,"POSITION TAPE AT
 STANDARD PARA- GRAPHS AND SET R
ECORDER TO  PLAY"
270 GOSUB 1020
280 FOR M=1 TO SP
290 CLS:PRINT@224, "SHORT NAME O
F PARAGRAPH ";M;"?":LINE INPUT P
$(M)
300 LINE INPUT "FILE NAME FROM S
CRIPSIT";M$
310 L=0
320 OPEN "I", #-1, M$
330 L=L+1
340 IF EOF (-1) THEN 460
350 INPUT #-1, PP$
360 LN=LEN(PP$)
370 LN=LN-1
380 T$=RIGHT$(PP$,1):IF T$<>" "
THEN 400
390 PP$=LEFT$(PP$,LN-1):GOTO 360
400 PP$=PP$+" "
410 SP$(M,L)=PP$
420 IF EOF(-1) THEN GOTO 460
430 INPUT #-1, PP$
440 SP$(M,L)=SP$(M,L)+PP$
450 GOTO 330
460 CLOSE #-1
470 LP(M)=L
480 NEXT M
490 CLS:PRINT "YOU NOW HAVE THES
E STD PARA'S:":FOR M= 1 TO SP: P
RINT M;"  "; P$(M):NEXT
500 GOSUB 1020
510 GOTO 50
520 REM PRINT LETTERS
530 CLS:PRINT @ 128, "POSITION T
APE AT BEGINNING OF  INDIVIDUAL
 PARAGRAPHS AND TURN  TO PLAY"
```

```
540 GOSUB 1020
550 CLS:PRINT @ 224,;:INPUT "HOW
 MANY LETTERS";N
560 FOR R=1 TO N
570 OPEN "I", #-1, "X"
580 REM INPUT STANDARD PARAGRAPH
 CODE
590 INPUT #-1, PN$
600 PN=VAL(PN$)
610 IF PN<>1 AND PN<>2 AND PN<>1
2 THEN PN=3
620 PRINT #-2, CHR$(31);TAB(13);
"MERRY CHRISTMAS";CHR$(30);CHR$(
13);CHR$(13);CHR$(13)
630 REM ERROR TRAP IF FORGOT PAR
A CODE
640 TP=5:IF PN=3 THEN PRINT #-2,
TAB(10);PN$:GOTO 670
650 INPUT #-1,PD$
660 PRINT #-2, TAB(10);PD$
670 PRINT #-2
680 IF EOF (-1) THEN CLOSE -1:GO
TO 850
690 REM PERSONALIZED PARA
700 INPUT #-1,PP$
710 IF PP$=CHR$(13) THEN 730
720 IF EOF (-1) THEN CLOSE -1:GO
TO 850
730 INPUT #-1, PP$
740 L=LEN(PP$)
750 L=L-1
760 T$=RIGHT$(PP$,1):IF T$<>" "
THEN 780
770 PP$=LEFT$(PP$,L-1):GOTO 740
780 PP$=PP$+" "
790 PRINT #-2, TAB(10); PP$;
800 TP=TP+1
810 IF EOF(-1) THEN CLOSE -1:PRI
NT #-2:GOTO 850
820 INPUT #-1, PP$
830 PRINT #-2, PP$
840 GOTO 720
850 PRINT #-2:IF PN=1 OR PN=12 T
HEN 870 ELSE 930
860 REM STD PARA 1
870 FOR CT=1 TO LP(1)
880 PRINT #-2, TAB(10);SP$(1,CT)
890 NEXT CT
900 TP=TP+LP(1)
910 IF PN=1 THEN 970
920 REM STD PARA 2
930 FOR CT=1 TO LP(2)
940 PRINT #-2, TAB(10);SP$(2,CT)
950 NEXT CT
960 PRINT #-2:TP=TP+LP(2)+2
970 PRINT #-2, CHR$(13);CHR$(31)
;TAB(20);"THE HADYS";CHR$(30):TP
=TP+4
980 FOR CT=1 TO 66-TP:PRINT #-2:
NEXT CT
990 PN=0
1000 NEXT R
1010 END
1020 PRINT @416, "PRESS ANY KEY
TO CONTINUE"
1030 CT$=INKEY$:IF CT$="" THEN 1
030
1040 RETURN
```

```
130.... 01BA
420.... 04C3
690.... 084A
960.... 0B48
END...0EBC
```

Listing 2:

```
10 REM STDLTR--XMAS LETTER GENER
ATOR--THIS VERSION WRITES STANDA
RD LETTERS
20 CLEAR 6000:LW=60:DIMP$(2),SP$
(40),AD$(3,50):L=0:N=0
30 CLS:PRINT @ 140, "MENU"
40 PRINT @ 160, "1. INPUT ADDRES
SEES"
50 PRINT @ 192,"2. READ ADDRESSE
ES ON SCREEN"
60 PRINT @224,"3. INPUT STANDARD
 PARAGRAPHS"
70 PRINT @256, "4. PRINT LETTERS
"
80 PRINT @ 288, "5. QUIT"
90 PRINT @ 395, "YOUR CHOICE?"
100 S$=INKEY$:S=VAL(S$):IF S$=""
```


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```
 THEN 100
110 IF S>=6 THEN 30
120 ON S GOTO 740, 140, 230, 480
, 130
130 CLS:END
140 '***READ FROM RECORDER***
150 GOSUB 710
160 NS=N:FOR N=1 TO NT
170 GOSUB 1180
180 IF N<NT THEN GOSUB 710
190 NEXT N
200 PRINT @ 488, "PRESS ANY KEY
TO RETURN TO MENU"
210 RY$=INKEY$:IF RY$="" THEN 21
0
220 N=NS:GOTO 30
230 REM STANDARD PARAGRAPHS
240 CLS:PRINT @ 96, "BEFORE USIN
G THIS SECTION OF THEPROGRAM YOU
 SHOULD HAVE COMPOSEDYOUR STANDA
RD PARAGRAPH IN"
250 PRINT "SCRIPSIT AND SAVED IT
 ON TAPE    (USING THE PRINT<5> T
O TAPE<2> OPTION)"
260 PRINT @320,"POSITION TAPE AT
 STANDARD PARA- GRAPH AND SET RE
CORDER TO  PLAY"
270 GOSUB 710
280 LINE INPUT "FILE NAME FROM S
CRIPSIT";M$
290 M=1
300 OPEN "I", #-1, M$
310 L=L+1
320 IF EOF (-1) THEN 440
330 INPUT #-1, PP$
340 LN=LEN(PP$)
350 LN=LN-1
360 T$=RIGHT$(PP$,1):IF T$<>" "
THEN 380
370 PP$=LEFT$(PP$,LN-1):GOTO 340
380 PP$=PP$+" "
390 SP$(L)=PP$
400 IF EOF(-1) THEN GOTO 440
410 INPUT #-1, PP$
420 SP$(L)=SP$(L)+PP$
430 GOTO 310
440 CLOSE #-1
450 CLS:PRINT "PARAGRAPH LOADED"
460 GOSUB 710
470 GOTO 30
480 REM PRINT LETTERS
490 CLS:PRINT @ 128, "IS STANDAR
D PARAGRAPH LOADED?       (Y OR N
)"
500 OK$=INKEY$:IF OK$="" THEN 50
0
510 IF OK$<>"Y" THEN 30
520 FOR LT=1 TO NT
530 PRINT #-2, CHR$(31);TAB(13);
"MERRY CHRISTMAS";CHR$(30);CHR$(
13);CHR$(13);CHR$(13)
540 PRINT #-2, TAB(10);"Dear ";A
D$(1,LT);",":PRINT #-2
550 PRINT #-2,TAB(10); "Hope the
 holiday season finds all well a
t the ";AD$(2,LT);".  "
560 CL=VAL(AD$(3,LT))
570 IF CL=2 THEN PRINT #-2,TAB(1
0) "Are you looking forward to a
 white Christmas?"
580 IF CL=1 THEN PRINT #-2,TAB(1
0); "With your climate, you shou
ld have a good chance for a"
590 IF CL=1 THEN PRINT #-2,TAB(1
0);"white Christmas."
600 IF CL=3 THEN PRINT #-2, TAB(
10);"There's not much chance you
 will have a white Christmas, I
guess."
610 PRINT #-2
620 FOR CT=1 TO L
630 PRINT #-2, TAB(10);SP$(CT)
640 NEXT CT
650 TP=7+L
660 IF CL=1 THEN TP=TP+1
670 PRINT #-2, CHR$(13);CHR$(31)
;TAB(20);"THE HADYS";CHR$(30):TP
=TP+4
680 FOR CT=1 TO 66-TP:PRINT #-2:
NEXT CT
690 NEXT LT
```


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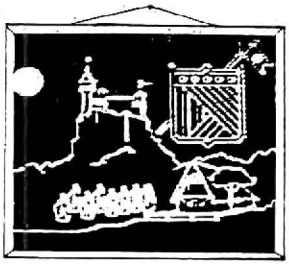
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```
700 GOTO 30
710 PRINT @416, "PRESS ANY KEY T
O CONTINUE"
720 CT$=INKEY$:IF CT$="" THEN 72
0
730 RETURN
740 REM INPUT ADDRESSEE INFORMAT
ION
750 CLS
760 PRINT:IF N>0 THEN PRINT @224
,"THERE IS ADDRESSEE INFORMATION
  ALREADY IN MEMORY.  DO YOU WIS
H TO ERASE (Y/N)?" ELSE 810
770 E$=INKEY$:IF E$="" THEN 770
780 IF E$="N" THEN 810
790 IF E$="Y" THEN N=0:GOTO 810
800 PRINT @40, "RESPOND Y OR N":
GOTO 760
810 CLS:PRINT @224, "PRESS <SHIF
T> AND <0> THEN PRESS <SPACEBAR>
"
820 C$=INKEY$:IF C$=" " THEN 830
 ELSE 820
830 N=N+1:IF N>50 THEN GOTO 1130
840 GOSUB 980
850 GOSUB 1040
860 GOSUB 1060
870 GOSUB 1180
880 PRINT @ 235, "ARE THESE OK?"
890 OK$=INKEY$:IF OK$="" THEN 89
0
900 IF OK$="Y" OR OK$="y" THEN 8
30
910 IF OK$="N" OR OK$="n"  THEN
930
920 CLS:GOTO 880
930 PRINT @235, "WHICH NUMBER IS
 BAD?"
940 ER$=INKEY$:IF ER$="" THEN 94
0
950 ER=VAL(ER$):IF ER>3 THEN PRI
NT @110,"ERROR":GOTO 930
960 ON ER GOSUB 990, 1040, 1060
970 GOTO 870
980 CLS:PRINT @9, "999 FOR MENU"
990 PRINT @ 170, "DEAR       ?":P
RINT @ 200:LINE INPUT AD$(1,N)
1000 IF AD$(1,N)="999" THEN CLS:
PRINT @224, "PRESS <SHIFT> AND <
0>, THEN PRESS <SPACEBAR> TO RET
URN TO MENU" ELSE 1030
1010 R$=INKEY$: IF R$=" " THEN 1
020 ELSE 1010
1020 NT=N-1:GOTO 30
1030 RETURN
1040 CLS: PRINT @ 163, "POSSESSI
VE FORM OF NAME?":PRINT @ 200:IN
PUT AD$(2,N)
1050 RETURN
1060 CLS:PRINT @ 100, "CLIMATE C
ODE"
1070 PRINT @ 132, "1. COLD"
1080 PRINT @ 164, "2. MODERATE"
1090 PRINT @ 196, "3. WARM"
1100 PRINT @ 230, "INPUT YOUR CH
OICE:"
1110 PRINT @ 270: INPUT AD$(3,N)
1120 RETURN
1130 CLS:PRINT @290,"MAXIMUM NUM
BER OF ENTRIES NOW
LOADED"
1140 CLS:PRINT @224, "PRESS <SHI
FT> AND <0>"
1150 CLS:PRINT @416, "PRESS ANY
KEY TO RETURN TO MENU":NT=N
1160 CT$=INKEY$:IF CT$="" THEN 1
160
1170 GOTO 30
1180 CLS: PRINT @ 96, "1. DEAR "
;AD$(1,N)
1190 PRINT @128, "2." AD$(2,N)
1200 IF VAL(AD$(3,N))=1 THEN CM$
="COLD"
1210 IF VAL (AD$(3,N))=2 THEN CM
$="MODERATE"
1220 IF VAL(AD$(3,N))=3 THEN CM$
="WARM"
1230 PRINT @ 160, "3. CLIMATE: "
;CM$
1240 RETURN
```


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X—AMATION!
Animation Using The X-Pad For Graphics Production

James H. Ford, Jr.

Recently, there has been a large focus on computer animation in this magazine and others that deal with Color Computer-related programming. If you, like me, have tried out any of these techniques you probably have come to two conclusions. First, it will take a little longer than forever to create a mini Walt Disney series. And second, drawing figures using keyboard commands of *DRAW, PAINT, LINE* or *CIRCLE* is quite awkward.

To say the least, it's hard work! Even if you are a CoCoist of the highest caliber, the production of scenery, additional figures and position changes can be quite time consuming. But, there is an easier way.

Enter X-Pad animation. The X-Pad, produced by Radio Shack specifically for the TRS-80 Color Computer, is a pen and tablet digitizing combination. The user may draw, paint and make circles and lines with the aid of menu-driven software. This is pen-tip graphics rather than fingertip (keyboard) graphics. The X-Pad, accompanying manual and demo software may be purchased from Radio Shack, or you may write your own program to drive the X-Pad graphics.

Sorry, there are no programs listed here that produce stand-alone graphics. You must have access to the X-Pad to perform the techniques that follow. I will present first, overviews of each technique, followed by a detail checklist of those techniques and finally a general summary (to include problem solving).

Overview (Technique #1)

The first technique to produce animation using the X-Pad is, of course, the simplest. Simply stated, you *DRAW* (set pixels) using pen and pad and then systematically *RESET* (erase) or add new pixels to the original drawing. In classical animation, this technique is

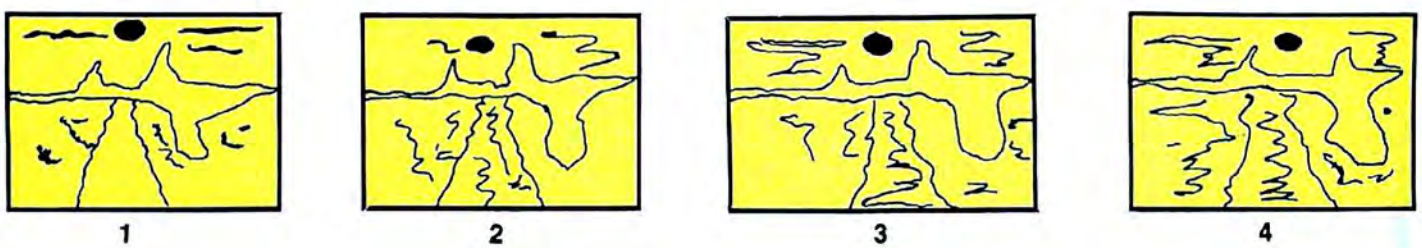
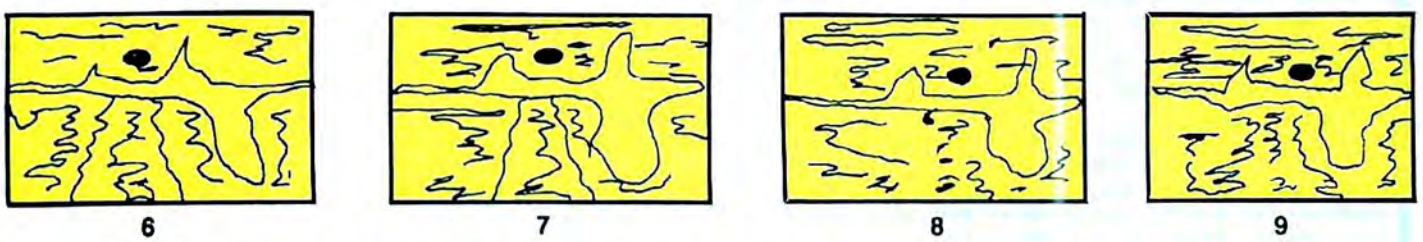


Figure #1 Storyboard
Start with #1 above, draw larger, SAVEM; Draw #2, etc.
(Technique 1)



(James Ford is the department head of commercial art at Houston Community College. He has been actively teaching computer graphics on the Color Computer for nearly a year.)

thought of as a combination of build-up (adding pixels or objects) and metamorphosis (changing the original object slowly into another object). The first drawing is saved to tape. Then visual information is added to the original or visual information is taken away and saved in its new form. The system of drawing, saving, re-drawing, saving is repeated until you have completely changed the drawing or portions of the original. Obviously, planning the entire drawing (from beginning to end) is most important.

It is necessary during the planning stages to sketch a storyboard, in order that you may follow it as you *SET* and *RESET* pixels. The storyboard is a series of drawings, chronologically set up, depicting the highlights of position changes (Example: each step in a walk sequence).

When the final drawing has been completed, a driver program is written to load each drawing into memory to be displayed on the screen in succession. As each new drawing is loaded, the old drawing is cleared (not necessarily from memory, but from the video screen) and the new drawing is displayed. My file tape loads 10 drawings. The selection of the kind of drawing is important. Scenery works best, for example, a South Sea island rolling ocean, sunsets behind mountains, etc. (See Checklist 1 & 2; Figure 1; Program Listing 1.)

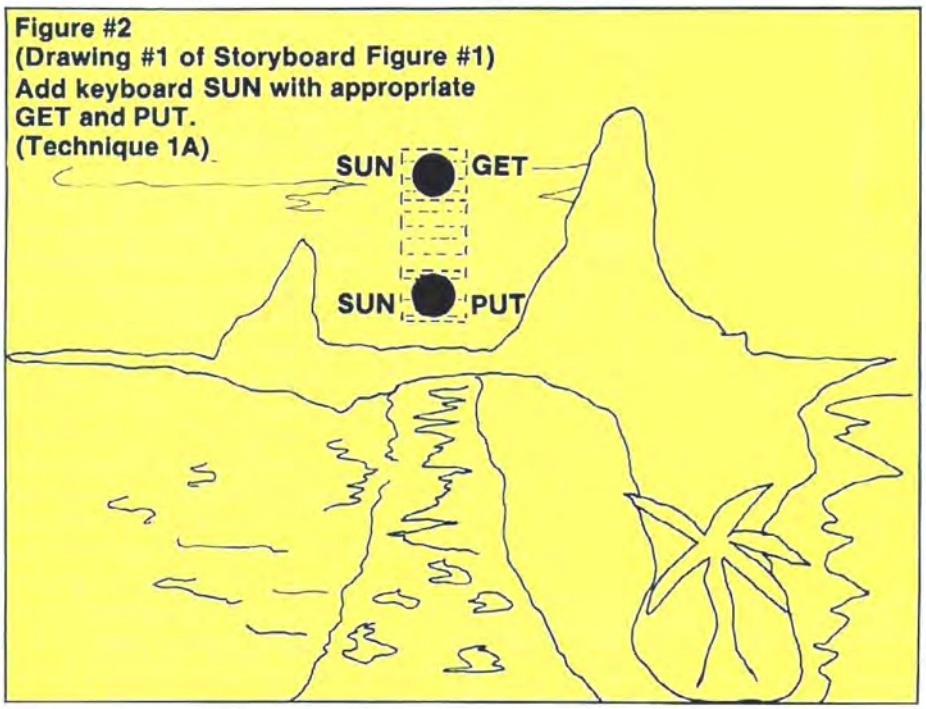
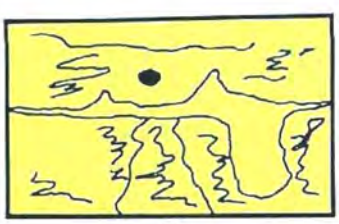


Figure #2
(Drawing #1 of Storyboard Figure #1)
Add keyboard SUN with appropriate GET and PUT.
(Technique 1A)

Overview (Technique #1A)

If you have successfully completed, saved and run your animated sun setting or ocean rolling into a South Sea island, your imagination is probably running rampant. You don't have to stop here. Try merging keyboard graphics with the X-Pad full color scenery. Program Listing 2 is a model for the keyboard graphics. I used only the first drawing of my island storyboard minus the sun. I then added the appropriate lines in the driver program to create a keyboard sun. The sun was drawn using *CIRCLE* and *PAINT* statements. It was moved to its new location with *GET* and *PUT* commands and finally a last *PAINT* statement, which gives a completely red background. I have used this



5



10

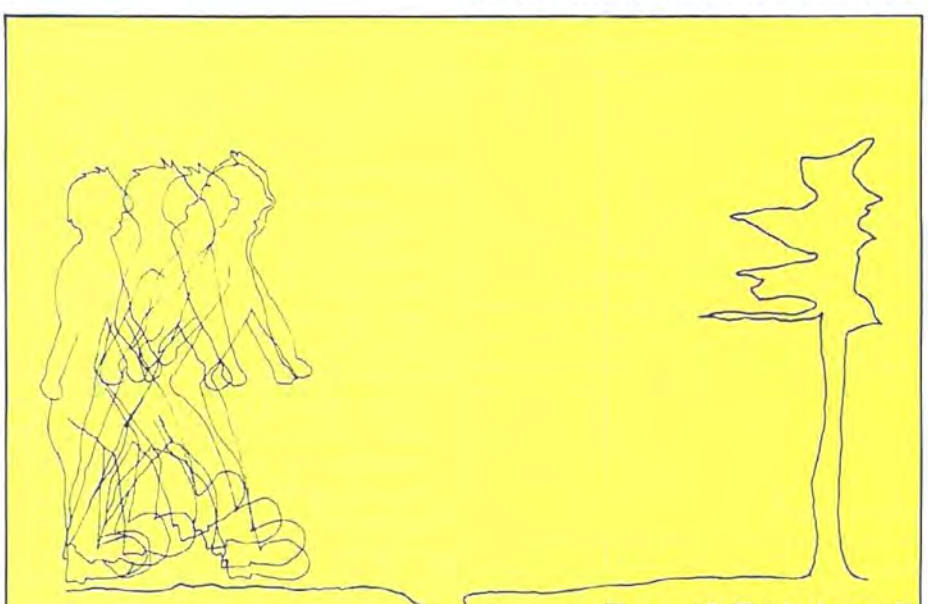


Figure #3 (Technique #2)
All drawings are done on graphics screen worksheet in overlay fashion, then traced with X-Pad, pen, SAVEMed, CLEARed and then the next position is drawn.

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S K I L L W A R E

technique to add a boat with a figure that rows across the scene; a lady that winks and, currently, I am working on a "talking head" with keyboard lip movements. (See Figure 2; Program Listing 2.)

Overview (Technique #2)

This technique does not produce animation as before because of the slowness of loading to memory and the way that graphics are displayed on the screen. Those of you who wish to produce graphics for cell-by-cell animation will find this a rather rapid production technique.

The technique is designed for use with an 8mm, 16mm single-frame camera or even a video camera and VCR. Unless you have a very professional video system, glitches (caused from stop and start) will appear in the playback. (See [*] for camera techniques in checklist.)

Classical animation normally involves drawing the images with ink onto an acetate surface. These acetate cells are then painted on the back using a vinyl paint, dried, and then registered on an animation stand. Finally, they are photographed with a movie camera that can be adjusted to expose single frames of the film.

In our case, we will expose each X-Pad drawing, directly on the TV screen, twice per drawing. Experience and the need for the image to be viewed for longer or shorter time durations will be the deciding factor. After the film has been processed it may be viewed on a projector at normal speed (24 frames per second); the illusion of movement is created as each new position (drawing) passes the lens of the projector.

Technique 2 utilizes the checklist and steps of Technique 1. There are two changes. The first is that the original storyboard is drawn on the 256 x 192 graphic screen worksheet (GSW) instead of a separate sketch pad. Secondly, after each drawing has been saved to tape you should clear the screen and redraw the new position or movement.

The camera is mounted on a tripod facing the TV screen. After the driver program loads a new image and clears the old image from the screen, you should photograph the image (twice per image/cell). If your camera does not possess a single-frame mechanism, film animation to some degree is still possible. You only need to press the on switch lightly, but rapidly, and then release the switch to off. You will probably not be able to simulate two frames each time but even then your image walking across the screen in crude paces will still produce many hours of great home entertainment. The camera must be stable during the photography or the final image will jump or appear blurred when viewed on the projector. (See Figure 3; Program Listing 3; Review checklist 1 & 2.)

Overview (Technique 3)

If you are still with me, you should be ready to produce your own version of "Snow White." If you are not familiar with the use of all pages, *PCLEAR*, the calculation of one and two dimensional arrays, then you should go back to the Color Computer Manual and review that portion.

This technique is not used much differently than other Color Computer animation techniques. However, the X-Pad provides the ability to produce faster graphics with more realism and ease. You will need to draw all figure or positions/movements on the graphics screen worksheet (not overlayed as in Technique 2). These positions are drawn inside of pre-defined rectangles which match exactly a one-or two-dimensional array. If you choose a one-dimensional array you will possibly be able to draw as may as 30 figures or positions on one GSW. A two-dimensional array will be faster; however, the number of figures will be limited due to memory allocation reserved by the *DIM*. One graphics screen worksheet represents four pages of video memory we will use to display each individual piece of that story.

Getting Started

On tracing paper or a graphic screen worksheet define a rectangular shape that matches your figure size. The tracing paper should also match the X-Pad template's inner dimensions. Repeat the rectangular shape over the worksheet until you arrive at the number of position changes you will need. Mark dotted lines inside the shapes to indicate usable drawing area. The blank space will aid in covering up the old image. Draw the figure and accompanying positions inside the rectangles with a pencil. I suggest you start at the top left and work right. If you have the transparent copy of the worksheet, place it over the two of these drawings. Sandwich the tracing paper, transparent GSW and the template and attach to the X-Pad. If you have no transparent worksheet, then draw on the paper worksheet. Trace the drawings with X-Pad pen. Clean up as necessary and *SAVEM*. Write a driver program with accompanying *DIM*, *GET* and *PUT* and *PCLEAR* and *SAVE* before the drawings. *CLOAD* the driver, *CLOADM* the graphics, *RUN*. Voila, X-Pad ani-

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mation. For additional details, see Technique 3 checklist.

NOTES: *My model represents a walk from screen left to screen center. The figure then stops to put on skates and then takes off again skating. Registration of the template, GSW and drawing is the most important step in this technique. You are working in the blind while drawing on the X-Pad. There is no easy way of knowing the location of the* SET *or* RESET *pixels. In order to* GET *what you want to* PUT, *you should draw as precisely as possible. If you use a driver similar to Listing 4, it bears repeating, be precise. Listing 5 allows adjustment, but is more time consuming. Keep your drawings small, but not necessarily simple. The (G) option in the* GET *will take care of all the graphic information.*

Summary And Problem Solving

X-Pad animation, or X-amation as I like to call it, has possibilities for the CoCoist on all levels. Without a doubt, it is one of the easier ways to produce full graphics with color to depict a more realistic situation.

I am quite sure that anyone who has ever painted cells for animation or created flipbooks should find that copying X-Pad graphics (see Technique 2) with a camera is much easier. No, your characters will not be drawn with the smoothness of a skilled animator and, of course, color selection is limited. But, it is another way to animate using a different kind of paint brush. And of those who, like me, get somewhat frustrated with attempting complex characters using awkward *LINE, DRAW,* etc. in BASIC, will find this easier. With a little experimentation, a little drawing patience and little attention to detail you should, within a couple days, be creating full-color characters and scenery.

Problem Solving:

It is important here to make you aware of some basic pitfalls that could make you "byte" your nails wondering where in memory land your program got off to.

1) *PCLS* clears the screen of course, but when used in conjunction with X-Pad graphics it is nearly worthless because you cannot recall the graphics unless you reload. (Remember you are setting and resetting pixels, therefore they are not defined by a line statement. Example: 10 line (0,0)-(255,191), *PSET*.) Be very conscious of where in the driver program *PCLS* is used.

2) *PCLEAR* is usable as I have set it up in the driver program examples. Should you experiment be ready for lots of FC Errors, SN Errors, lost graphics and full programs. Make sure you save a good copy of the graphics first, and the driver program, second, before you run the program. (Even here in the model program, the *PCLEAR* produces an SN Error the first time it's run.)

3) I have found that loading to Pages 5—8 in conjunction with *PCLEAR* and a few *GET*s and *PUT*s here and there produces interesting effects (lost graphics, hanging computer, hanging cassette, etc.). Experiment! I am.

4) Make sure you *GET* and *PUT* the exact array size as you have *DIMensioned* or you will produce FC Errors. Putting a smaller area of the *GET, GET*s you garbage. *AND, OR, NOT,* and *PRESET* with *PUT* have possibilities, but I have not as of yet had a chance to experiment fully.

5) When you sandwich the template and map ensure they are aligned correctly, else when you get your drawing it may not be where you thought it was.

6) Adjustments are easy to make if your *GET* and *PUT* and registration is off. Move the coordinates for the *GET* or *PUT* until they are correct.

7) If adjustments do not work, reload the graphics into the X-Pad menu and erase, add, etc., and resave.

8) If you do not have the save option included in the X-Pad Demo:

a) Type CSAVEM"FILE NAME",1536,7689,1

b) To load, type CLOADM "FILENAME"

c) Be sure to initialize, example :10 PMODE3,1:PCLS:SCREEN1,1 then type CLOADM "FILENAME"

d) Once loaded, delete *PCLS* in Line 10

e) You may now write your driver program

f) Option (a), above, will save the graphics to Pages 1—4. Yes, the graphics automatically load to Pages 1—4.

9) Keep constant watch on your machine's memory when attempting eight pages plus driver and additional keyboard graphics. *POKE 65495,1* speeds up the graphics.

10) Neither the Demo program purchased from Radio Shack nor the menu found in Appendix E of the X-Pad manual include a saving option. You may easily include the save option found on Pages 35, 36 and 37. Unless Radio Shack has now produced a 16K version of the demo (be sure before you buy), the demo is 32K and will not load to 16K. Sorry, if this is the case, you will have to type Appendix E. Have fun, it contains numerous bugs and takes about 3½ hours of lightning speed typing to finish. Yes, it's also true that the X-Pad has very touchy potentiometers no matter what Radio Shack contents. However, I feel the worth of the pad is greater than the frustrations.

List Of Tools And Special Knowledge

1) X-Pad (model GT-116)
2) 16K or 32K Extended BASIC Color Computer
3) Tracing paper and scratch pad
4) Copies of the high resolution graphics screen worksheet (256 x 192)
5) Software to drive the X-Pad graphics (Demo tape from Radio Shack or type the program from Appendix E of the X-Pad manual)
6) Good hand/eye coordination (drawing or tracing ability)
7) Understanding array calculation for one and two dimensions
8) Understanding of *PCLEAR,* and PAGE commands for the Color Computer
9) Transparent copy of (5), above
10) Understanding of single-frame animation using 8 or 16mm
11) 8mm, 16mm or Video Camera
12) Understand storyboards
14) Tripod

Checklist Technique 1 and Technique 2

0) See (16), below, before you start.
1) Connect the X-Pad
2) Load the menu or Demo tape
3) Position X-Pad template over graphics screen worksheet (align with top horizontal and left vertical border lines of inside of template).
4) Attach to the X-Pad.
5) On scratch pad, sketch a story (see Figure 1).
6) Draw first scene (in pencil) on the graphic screen worksheet.
7) Select the *DRAW* command with X-Pad pen.
8) Trace the first scene.
9) Use *PAINT, ERASE,* etc., as necessary.
10) Start over by clearing if mistakes occur.
11) *SAVEM* to tape (see summary).
12) When *SAVEM* is completed, (drawing will reappear) *RESET* (erase) add (draw) as necessary the next scene in your story.



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12A) If Technique 2, clear drawing and draw next position.
13) *SAVEM* to tape.
14) Repeat steps 8 through 13 until entire story completed.
15) Write a driver program (see example program Listing 1).
16) Save to tape (the driver should be saved to tape before the first. If you are sure of the filename you wish to use for each scene and the format you wish to use to load them, then do this step first). Return to (1) above.
17) Rewind tape to driver program.
18) Type *CLOAD*"FILENAME OF DRIVER."
19) Type *RUN*.

NOTES: If the above steps have been followed, you may sit back and watch the waves roll in upon the shores of your very own South Sea island. Remember, scenery works best (see Technique #1A).
TERMS: Storyboard — series of chronological sketches.

Checklist Technique #1A

1) Do steps 1, 2, 3 and 5.
2) *SAVEM* to tape.
3) Write a driver and keyboard graphics program (see program Listing 2).
4) Save to tape (see step 15 in Technique 1).
5) Rewind to driver.
6) Type *CLOAD*"FILENAME OF DRIVER."
7) Type *RUN*.

Checklist (Technique 3)

1) Load the menu for X-Pad.
2) Attach worksheet as before.
3) Calculate the array (see overview).
4) Draw each rectangular array on the worksheet (be precise).
5) Draw your figure within the array in each different position (I suggest starting at the top left and working to the right).
6) Be sure you make the figure slightly smaller than the array. The blank area between the figure and array boundaries will cover up the old figure.
7) Trace your figures with pen of the X-Pad (add color as necessary, etc.).
8) If you wish to add scenery in the rectangular array, then do so.
9) *SAVEM* to tape.
10) Write a driver program and save in front of the graphic as before (see program Listings 4, 5, 6).
11) *CLOAD* the driver.
12) *CLOADM* "X-PAD GRAPHICS."
13) *POKE65495*, I will speed up animation; *POKE65494,0* returns to normal.
14) If using program Listing 6, *EDIT* line and remove the *PCLS* and *CLOADM*.

Editor's Note: The programs listed here are for example only and are not self-supporting. Graphic screens must be created using an X-Pad and instructions in the article in order to *RUN* these programs.

Listing 1:

```
10 PMODE3,1
20 PCLS
30 SCREEN1,1
40 CLOADM"SUNSET1"
55 CLOADM"SUNSET2"
70 CLOADM"SUNSET3"
85 CLOADM"SUNSET4"
100 CLOADM"SUNSET5"
115 CLOADM"SUNSET6"
130 CLOADM"SUNSET7"
140 CLOADM"SUNSET8"
150 CLOADM"SUNSET9"
160 CLOADM"SUNSET10"
170 GOTO170
```

Listing 2:

```
10 PMODE3,1:SCREEN1,1:DIMV(20,20
)
20 CIRCLE(128,12),5,8:PAINT(128,
12),8,8
30 GET(122,4)-(136,20),V,G
40 FORI=6TO24
50 PUT(122,4+I)-(136,20+I),V,PSE
T
60 NEXTI
70 PAINT(128,24),8,8
80 GOTO80
```

Listing 3:

```
0 REM WALKER-TECHNIQUE USED WITH
 8MM OR 16MM SINGLE FRAME CAMERA
TIME STATEMENT ALLOWS PHOTOGRAPH
ING WALKER TWO FRAMES PER DRAWIN
G. ONLY FOUR DRAWINGS OF 29
10 PMODE3,1
20 PCLS
30 SCREEN1,1
50 CLOADM"MAN1"
55 FORT=1TO1000:NEXTT
60 PCLS
70 CLOADM"MAN2"
75 FORT=1TO1000:NEXTT
80 PCLS
90 CLOADM"MAN3"
95 FORT=1TO1000:NEXTT
100 PCLS
110 CLOADM"MAN4"
115 GOTO115
```

Listing 4:

```
0 REM FULL X-PAD ANIMATION
 X-DRIVER BY NAME GET INDIVIDUAL
   DRAWINGS FROM PAGES 1-4 PUTS
  ON PAGES 5-8 (MUST CLOADM X-DR
AW THEN TYPE RUN10...WILL PRODUC
E   SN ERROR IN 32 FIRST TIME TY
PE   RUN AGAIN)
1 REM WHEN RUN IS TYPED PAGES 1-
4 ARE DISPLAYED ALONE...BREAK TY
PE RUN10!!!PROGRAM LISTING #4 (S
EE ALSO PROGRAM LISTING 5 AND 6
FOR DIFFERENT VERSION
2 PMODE3,1:SCREEN1,0:GOTO2
10 CLS
```

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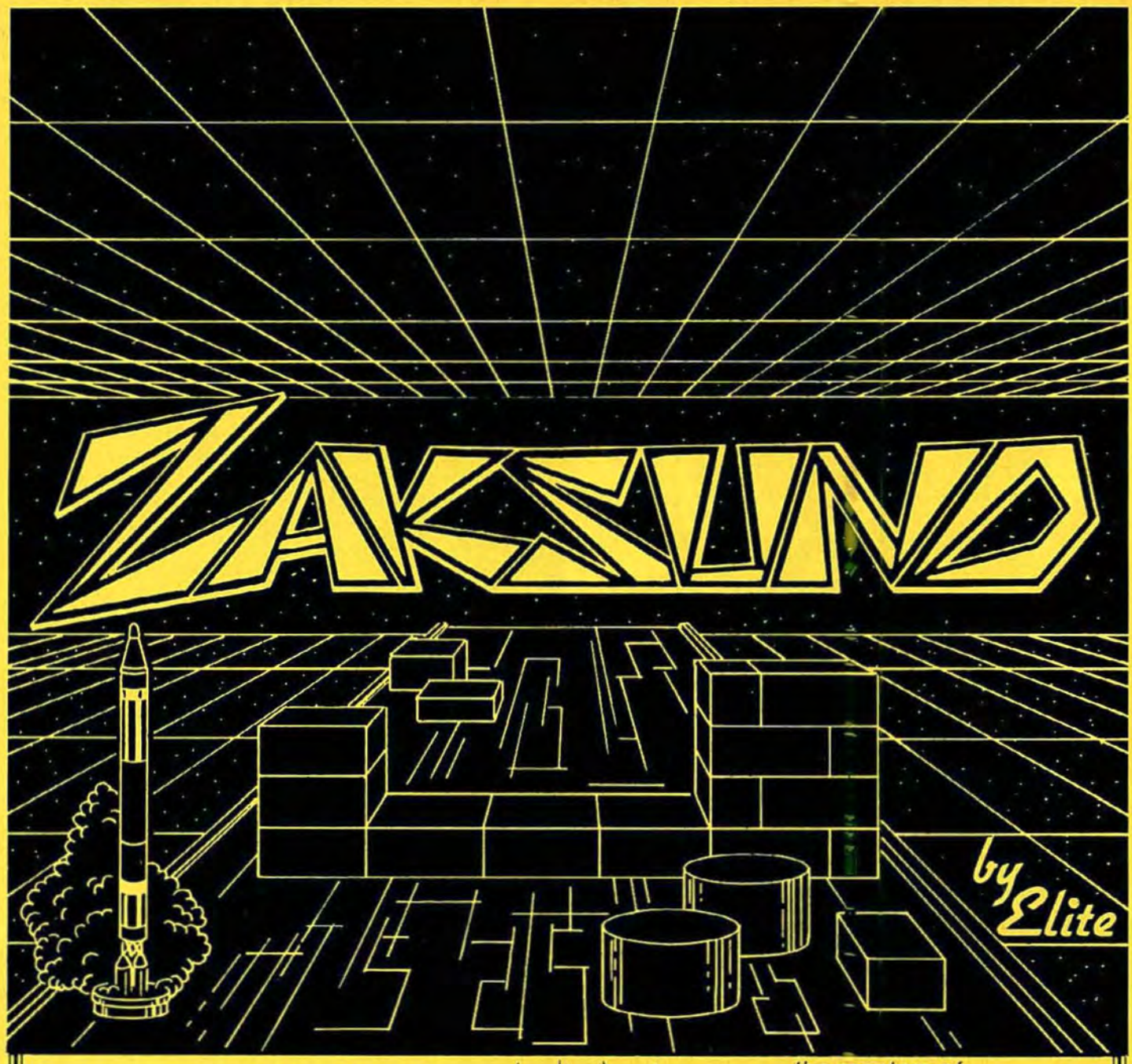
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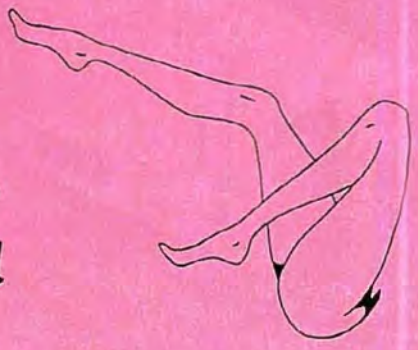
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```
20 PCLEAR8
30 DIMA(29)
32 PMODE3,5:PCLS2:SCREEN1,0
36 FORX=2TO126STEP24
40 PMODE3,1:GET(X,4)-(X+20,58),A
,G
50 PMODE3,5:SCREEN1,0:GOSUB1000
81 NEXTX
161 FORX=122TO222STEP24
170 PMODE3,1:GET(X,4)-(X+20,58),
A,G
176 PMODE3,5:SCREEN1,0:GOSUB1030
200 NEXTX
211 FORX=52TO126STEP24
220 PMODE3,1:GET(X,4)-(X+20,58),
A,G
230 PMODE3,5:SCREEN1,0:GOSUB1060
260 NEXTX
271 FORX=122TO222STEP24
280 PMODE3,1:GET(X,4)-(X+20,58),
A,G
290 PMODE3,5:SCREEN1,0:GOSUB1090
310 NEXTX
311 PMODE3,5:PCLS2
320 FORX=50TO122STEP24
330 PMODE3,1:GET(X,60)-(X+20,114
),A,G
340 PMODE3,5:SCREEN1,0
350 PUT(10,56)-(30,110),A,PSET
360 FORT=1TO500:NEXTT
370 NEXTX
380 FORX=122TO50STEP-24
390 PMODE3,1:GET(X,60)-(X+20,114
),A,G
400 PMODE3,5:SCREEN1,0
410 PUT(10,56)-(30,110),A,PSET
420 FORT=1TO500:NEXTT
430 NEXTX
450 PMODE3,1:GET(142,60)-(162,11
4),A,G
460 PMODE3,5:PCLS2:SCREEN1,0
470 FORI=10TO60STEP2
480 LINE(I,107)-(I,107),PSET
490 PUT(5+I,56)-(25+I,110),A,PSE
T
500 NEXTI
510 PMODE3,1:GET(168,60)-(188,11
4),A,G
520 PMODE3,5:SCREEN1,0
530 FORI=60TO110STEP2
540 LINE(I,107)-(I,107),PSET
550 PUT(7+I,56)-(27+I,110),A,PSE
T
560 NEXTI
570 PMODE3,1:GET(198,60)-(218,11
4),A,G
580 PMODE3,5:SCREEN1,0
581 PUT(128,56)-(148,110),A,PSET
590 FORX=4TO52STEP24
600 PMODE3,1:GET(X,118)-(X+20,17
2),A,G
610 PMODE3,5:PCLS2:SCREEN1,0
620 PUT(128,56)-(148,110),A,PSET
630 FORT=1TO100:NEXTT
640 NEXTX
650 GOTO650
1000 Z=1
1010 PUT(1+Z,56)-(21+Z,110),A,PS
ET
1020 IFZ=<2THENRETURN ELSE36
1030 Z=1
1040 PUT(4+Z,56)-(24+Z,110),A,PS
ET
1050 IFZ=<8THENRETURN ELSE161
1060 Z=1
1070 PUT(6+Z,56)-(26+Z,110),A,PS
ET
1080 IFZ=<12THENRETURN ELSE210
1090 Z=1
2000 PUT(6+Z,56)-(26+Z,110),A,PS
ET
2010 IFZ=<14THENRETURN ELSE271
```

Listing 5:

```
0 REM X-DRSHRT(X-DRIVER SHORT VE
RSION PROGRAM LISTING #5) SEE AL
SO LONG VERSION PROGRAM LISTING
#6
5 PMODE3,1:SCREEN1,0:GOTO5
10 CLS
20 PCLEAR8
30 DIMA(28)
34 PMODE3,5:PCLS2
35 FORX=4TO220STEP24
40 PMODE3,1:GET(X,4)-(X+20,58),A
,G
50 PMODE3,5:SCREEN1,0
60 FORZ=1TO4STEP2:NEXTZ
70 PUT(Z,56)-(Z+20,110),A,PSET
80 NEXTX
160 FORX=4TO220STEP24
170 PMODE3,1:GET(X,4)-(X+20,58),
A,G
176 PMODE3,5:SCREEN1,0
180 FORZ=3TO6STEP2:NEXTZ
190 PUT(Z,56)-(Z+20,110),A,PSET
200 NEXTX
210 GOTO210
```

Listing 6:

```
0 REM X-DRILON (X-DRIVER LONG VE
RSION PROGRAM LISTING #6) CLOADM
 X-DRAW FIRST THEN TYPE RUN TO S
EE X-PAD DRAWING BREAK THEN TYPE
 RUN10 TO SEE ANIMATION
1 PMODE3,1:SCREEN1,0:GOTO1
10 CLS
20 PCLEAR8
30 DIMA(28),B(28),C(28),D(28),E(
28),F(28),G(28),H(28),I(28),J(28
```

```
),K(28),L(28),M(28),N(28),O(28),
P(28),Q(28),R(28),S(28)
40 PMODE3,5
50 PMODE3,1:GET(4,4)-(24,58),A,G
55 PMODE3,5:PCLS2:SCREEN1,0
60 PUT(4,56)-(24,110),A,PSET
70 PMODE3,1:GET(28,4)-(48,58),B,
G
80 PMODE3,5:SCREEN1,0
90 PUT(6,56)-(26,110),B,PSET
100 PMODE3,1:GET(48,4)-(68,58),C
,G
110 PMODE3,5:SCREEN1,0
120 PUT(6,56)-(26,110),C,PSET
130 PMODE3,1:GET(74,4)-(94,58),D
,G
140 PMODE3,5:SCREEN1,0
150 PUT(8,56)-(28,110),D,PSET
160 PMODE3,1:GET(96,4)-(116,58),
E,G
170 PMODE3,5:SCREEN1,0
180 PUT(8,56)-(28,110),E,PSET
190 PMODE3,1:GET(124,4)-(144,58)
,F,G
200 PMODE3,5:SCREEN1,0
210 PUT(10,56)-(30,110),F,PSET
220 PMODE3,1:GET(148,4)-(168,58)
,G,G
225 PMODE3,5:SCREEN1,0
230 PUT(10,56)-(30,110),G,PSET
250 PMODE3,1:GET(172,4)-(192,58)
,H,G
260 PMODE3,5:SCREEN1,0
270 PUT(10,56)-(30,110),H,PSET
280 PMODE3,1:GET(196,4)-(216,58)
,I,G
290 PMODE3,5:SCREEN1,0
300 PUT(13,56)-(33,110),I,PSET
310 PMODE3,1:GET(220,4)-(240,58)
,J,G
320 PMODE3,5:SCREEN1,0
330 PUT(14,56)-(34,110),J,PSET
340 PMODE3,1:GET(6,58)-(26,112),
K,G
350 PMODE3,5:SCREEN1,0
360 PUT(14,56)-(34,110),K,PSET
370 PMODE3,1:GET(29,60)-(49,114)
,L,G
380 PMODE3,5:SCREEN1,0
390 PUT(13,56)-(33,110),L,PSET
400 PMODE3,1:GET(53,58)-(73,112)
,M,G
410 PMODE3,5:PCLS2:SCREEN1,0
420 PUT(17,56)-(37,110),M,PSET
430 PMODE3,1:GET(4,4)-(24,58),A,
G
440 PMODE3,5:SCREEN1,0
450 PUT(17,56)-(37,110),A,PSET
460 PMODE3,1:GET(28,4)-(48,58),B
,G
470 PMODE3,5:SCREEN1,0
480 PUT(18,56)-(38,110),B,PSET
490 PMODE3,1:GET(48,4)-(68,58),C
,G
500 PMODE3,5:SCREEN1,0
510 PUT(19,56)-(39,110),C,PSET
520 PMODE3,1:GET(74,4)-(94,58),D
,G
530 PMODE3,5:SCREEN1,0
540 PUT(20,56)-(40,110),D,PSET
550 PMODE3,1:GET(98,4)-(118,58),
E,G
560 PMODE3,5:SCREEN1,0
570 PUT(21,56)-(41,110),E,PSET
580 PMODE3,1:GET(124,4)-(144,58)
,F,G
590 PMODE3,5:SCREEN1,0
600 PUT(22,56)-(42,110),G,PSET
610 GOTO610
```


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Hint . . .

What's Your ROM Number?

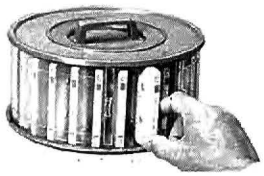
With all the talk about new ROMs, you may be wondering exactly which ROM you have. If you have Extended BASIC, just read the information at the top of the screen on power up. Then, to see which Color BASIC ROM you have, type *EXEC* 41175 and <ENTER>.

If you have the new ROMs, the Extended BASIC will indicate Version 1.1 and Color BASIC will be Version 1.2

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PRINT #2,

(Continued from page 14)

number of the programs we have run. What we look to do now is explore the less formal educational process and help you, to use (I admit it) a bad word, interface computers and kids.

I recall how much of what I learned in my early years was at the dinner table, listening to my mother, father and their friends talk about things. It is this sort of informal education that we want to deal with in terms of CoCo. More later.

Second, we are exploring ways to make it easier for you to actually obtain the programs we publish. Yes, we offer *Rainbow On Tape*, which is pretty well praised as the "best" of the tape services of any magazine (at least, that's what the mail says), but we're looking at ways that we might make it easier (and, perhaps, less costly) for you to get programs directly from us. At this point, I am not sure whether we will be successful or not, but one of the things we will be doing in 1984 is trying.

Third, we have a few little surprises up our sleeves for the coming year. My wife accuses me of liking surprises too much, but it is a fault to which I admit. Let me just say that a surprise isn't a surprise unless it is a surprise. So, I won't tell you about these. But, I think you'll find us doing a couple of unique things in the next year. Just wait and be surprised.

Oh yes, it *is* the time of year for gift lists, isn't it? CoCo has made its own wish list, too. And some of those wishes are:

- A hard disk drive.
- Some really unique games that will, of themselves, get people talking.
- More horizontal programs designed for the specific use of various businesses and professions. CoCo has proved it can run a small business. Now, he wants to help with specific applications for specialized businesses.
- More fans. Darn it, CoCo *is* by far the best computer on the market in anything like its price range. When will more people wise up to that fact?
- And a couple of big surprises. CoCo says it, like me, likes surprises. There were some really nifty ones in 1983 and CoCo hopes more are on the way.

And there's a wish from all of us at *the Rainbow*, too.

Our very best wishes for a most joyous holiday and a very happy and healthful new year. May you find a rainbow every single day!

—Lonnie Falk

Hint . . .

Print Out Disk Directory

If you have a long disk directory and want to see all of it, or if you simply wish to have a hard-copy printout of your directory, on simple command will allow you to do this easily.

Just *POKE111,254:DIR* and the entire disk directory will appear on your printer, even if it is too long to be fully displayed on your screen.

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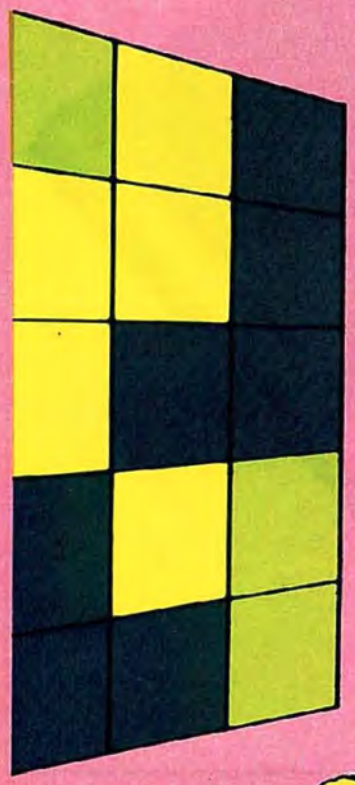
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16K
ECB

the RAINBOW



LET'S GET TRIVIAL

By Glen R. Tapanila





Let's Get Trivial is a two person game requiring quick recall of mostly useless facts and some strategic talent. The object is to correctly answer as many questions and capture as many squares on a playing board as possible. The program requires 16K, Extended Color BASIC and two joysticks. Do not key in any of the REM statements and, to save room, leave no unnecessary spaces.

The Play Of The Game

Type in the program and *RUN* it. The game begins by asking for the names of the players. A playing board with 48 squares is drawn. Two circles appear in the middle of the fourth row down. The yellow circle is the movement piece for the player at the left joystick. The blue circle is for the person at the right.

A trivia question and four possible answers (numbered 1 through 4) come on the screen. The first player to press the fire button on his joystick gets a chance to answer the question. Hold the fire button

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Rainbow, April '83

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Hot CoCo, August '83

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Color Computer Magazine, June '83

The installation procedure is well detailed and quite simple...Has a professional feel, reacts well to the touch... has held up to some purposeful pounding...

Color Computer News, June '83

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SUPER SCREEN

the Color Computer Supercharger



- **A big 51 character by 24 line screen.**
- **Full upper and lower case characters.**
- **Easily combine text with hi-res graphics.**
- **PRINT @ is completely functional on the big screen.**
- **The powerful ON ERROR GOTO is fully implemented.**
- **Auto-key repeat for greater keyboard convenience.**
- **Control codes for additional functions.**
- **Works with 16K, 32K or 64K computers.**
- **Available on disc or cassette.**

51 CHARACTER BY 24 LINE DISPLAY

Super Screen is a powerful, machine language program that significantly upgrades the performance and usefulness of 16K or greater, Extended and Disc Basic Color Computers. The standard Color Computer display screen is totally inadequate for serious, personal or business applications so Super Screen replaces it with a brand new, 51 character wide by 24 line screen including full upper and lower case characters. Instead of a confusing checkerboard appearance, you now have true lower case letters along with a screen that is capable of displaying 1224 characters. The difference is startling! Your computer takes on new dimensions and can easily handle lines of text that were simply too long and complex to display on the old screen.

COMBINE TEXT WITH HI-RES GRAPHICS

You can now write truly professional looking programs that combine text with hi-res graphics. Super Screen allows you to create graphics displays with the Basic LINE. DRAW and CIRCLE statements and then notate the graphics with descriptive text. You can even use PRINT @ if you wish for greater programming convenience. Super Screen's versatility will amaze you.

PRINT @ IS FULLY IMPLEMENTED

The PRINT @ statement is a valuable asset to the programmer when formatting text on the screen. The standard Color Computer will report an error if you specify a location higher than 511 but Super Screen allows locations all the way to 1223! You get a big screen and a powerful formatting tool as well. Of course, Super Screen also supports the CLS command allowing you to clear the big screen using standard Basic syntax.

ON ERROR GOTO

That's right! Super Screen gives you a full implementation of ON ERROR GOTO including the ERR and ERL functions. Now you can trap errors and take corrective action to prevent crashed programs and lost data using the same standard syntax as other computers. The ON ERROR GOTO capability overcomes a serious deficiency of Color Computer Basic and greatly improves your capability to handle sophisticated tasks. All well written, 'user friendly' programs use error trapping techniques and yours can too! Now that's power!

AUTO KEY REPEAT

No more frustration as you edit a long line in your Basic program; just hold the space bar down and automatically step to the desired position in the line. Need a line of asterisks? Hold the key down and auto repeat will give them to you. Those of you who spend many hours at your keyboard will appreciate this outstanding addition to Super Screen's long list of impressive capabilities.

CONTROL CODES FOR ADDITIONAL FUNCTIONS

Super Screen recognizes several special control code characters that allow selection of block or underline, solid or blinking cursor and other functions. You can 'Home up' the cursor or you may erase from the cursor to the end of a line or to the end of the screen just like many other computers. These special codes give you an extra dimension of versatility and convenience that put Super Screen in a class by itself.

AND MORE GOOD NEWS...

Super Screen comes with complete, well detailed instructions and is available on cassette or disc. It adjusts automatically to any 16K or greater, Extended or Disc Basic Color Computer or TDP-100 and uses only 2K of memory in addition to the screen memory reserved during power up. Guaranteed to be the most frequently used program in your software library...once you use it, you won't be without it! Super Screen's low price will really please you; only $29.95 on cassette or $32.95 on disc!

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SPACE RAIDERS—A sensational rendition of the arcade classic. No collection is complete without this invaders type game. Great sounds and tense action. We think it's the best. **Cassette—$24.95 / Disc $27.95.**

CAVE HUNTER—Maneuver your way to the bottom of a spooky old cave to retrieve the treasures. It's fun but not easy! Passages lead in all directions and angry cave creatures pursue you relentlessly. A fast placed arcade game. **Cassette—$24.95 / Disc $27.95.**

ASTRO BLAST—Wave after wave of alien attackers—each one different and unique. A great space "shoot-em-up" with hi-res graphics, lots of color and dramatic sound effects. A continuing best seller. **Cassette—$24.95 / Disc $27.95.**

HAYWIRE—This challenging combination of angry robots and the evil menace will provide many hours of fun and excitement. Haywire is the best Color Computer version of the Berzerk arcade game you can get. **Cassette—$24.95 / Disc $27.95.**

BLACK SANCTUM—If you enjoy suspense, you'll love this one. Encounter the forces of black magic as you roam around an old 18th century monastary. Watch out for the black hooded figures! **Cassette—$19.95.**

CALIXTO ISLAND—A challenging puzzle with an occasional twist of humor. You'll visit a secret laboratory, a Mayan pyramid and you'll meet crazy Trader Jack who adds to the fun. **Cassette—$19.95.**

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down until the question disappears and you see a message telling who was first to press. If neither player presses his fire button, the answer appears after a short while and the question is passed.

There is a small chance that both players may hit their buttons at exactly the same time. If that happens, both players should continue pressing the buttons until the answer appears and the question is passed. If either player lets go, his opponent gets a chance to answer.

After the screen showing who won the chance to answer disappears, a screen is displayed with a box in the center. To answer a question, a player rotates his joystick. When the stick points toward the fire button a "1" appears in the box. Pushed to the right, up comes a "2." Move your joystick straight down for a "3" and to the left for a "4." When the player has his answer in the box he presses the fire button and his choice registers.

If the choice is correct, the player gets a move. If not, his opponent does. The board is brought back to the screen. Movement consists of moving your circle from one square to another. For each green square you move into you get one point and capture the square. Each square you capture becomes the same color as your circle when you move out.

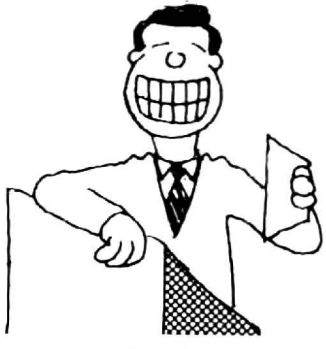
Direction can be up, down, left, or right. Use the joystick to select direction. A red line sticks out of the circle toward the direction the joystick is pointing. Pressing the fire button triggers the move. You cannot move off the board or into the same square as your opponent. You can move into a yellow or blue square, although you receive no points for the move and do not capture the square. If you are moving from a square that had previously been captured, rotate the red direction line a bit before pressing the joystick to make sure the direction registers. It is to your benefit to surround or cut off the moves of your opponent.

The game ends after 45 questions have been asked. Final scores are displayed, then the board reappears and remains on the screen.

To insure proper play of the game, do not repeatedly push the fire button. Use it only when necessary.

Let's Get Trivial is very easy to expand upon with your own questions. Lines 1720 through 2160 are the 45 *DATA* statements for the questions and answers. The first string variable is the question. Next is a numeric variable showing the number of the correct answer, followed by four choices for the answer. Just type in your questions according to this format.

If you have 32K, you can add more questions. For 50 questions per game, just change statement number 80 to read FORII=1TO50:GOSUB370 and type in five more questions at the end of the program. The game also ends if all 48 squares are captured.



(Glen Tapanila is a systems analyst for the state of Washington. He and his wife are producing pottery and microcomputer software.)

170....01B0	1450 ..0E3C
450....0441	1720 ...10A3
730....06A1	1860 ...15A4
1000 ...08E7	1970 ...1978
1190 ..0AAF	2080 ...1CF5
1290 ..0CDD	END ...201A

The listing:

```
10 REM LET'S GET TRIVIAL
20 REM BY GLEN TAPANILA
30 DIMSC(2):SC(1)=1:SC(2)=1
40 REM ************************
*******
50 REM **  SETUP, MAINLINE, AND
END  **
60 REM ************************
*******
70 GOSUB140
80 FORII=1TO45:GOSUB370
90 NEXTII
100 GOSUB1640
110 GOTO110
120 REM ************************
********
130 REM ** INTRO & SETUP **
140 CLS5
150 PRINT@131,"LET'S GET TRIVIAL
!!";
160 PRINT@163,"BY GLEN TAPANILA"
;
170 PRINT@225,"ENTER THE NAMES O
F THE PLAYERS ";
180 DIMP$(2)
190 INPUT"RIGHT JOYSTICK:";P$(2)
200 INPUT"LEFT JOYSTICK:";P$(1)
210 REM ** DRAW THE BOARD **
220 PMODE 3,1:PCLS:SCREEN1,0:LIN
E(0,0)-(255,191),PSET,B:K=0
230 FORJ=1TO7
240 K=K+31:LINE(K,0)-(K,191),PSE
T
250 K=K+1:LINE(K,0)-(K,191),PSET
260 NEXTJ:K=0:FORJ=1TO5
270 K=K+31:LINE(0,K)-(255,K),PSE
T
280 K=K+1:LINE(0,K)-(255,K),PSET
290 NEXTJ
300 REM ** DRAW PIECES  **
310 CIRCLE(113,113),6,6
320 PAINT(113,113),6
330 CIRCLE(145,113),6,7
340 PAINT(145,113),7
350 OL(1)=6:OL(2)=7:LX=113:LY=11
3:RX=145:RY=113:RETURN
360 REM ** MAIN LINE  **
370 GOSUB450
380 IF(PR=1)OR(PR=2) GOSUB590
```

```
390 IF(PR=1)OR(PR=2)GOSUB630
400 GOSUB870
410 IF(PR=1)OR(PR=2)GOSUB1000
420 IFSC(1)+SC(2)=48 THEN II=51
430 RETURN
440 REM ** PUT QUESTIONS & ANSWE
RS ON BOARD **
450 CLS:READQN$:READRA:FORA=1TO4
:READA$(A):NEXT
460 PRINT@32,QN$
470 PRINT@99,"1 "A$(1)
480 PRINT@131,"2 "A$(2)
490 PRINT@163,"3 "A$(3)
500 PRINT@195,"4 "A$(4)
510 FORA=1TO1000
520 P=PEEK(65280)
530 IF((P=253)OR(P=125)) THEN GO
TO560 ELSE IF((P=254)OR(P=126))
THEN GOTO570
540 NEXTA
550 PR=0:GOTO580
560 PR=1:GOTO580
570 PR=2
580 CLS:RETURN
590 CLS:FORA=1TO300
600 PRINT@32,P$(PR)" WAS FIRST"
610 NEXTA:RETURN
620 REM ** HAVE PLAYER ANSWER QU
ESTION **
```


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RAINBOW

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```
630 CLS:P=PEEK(65280)
640 IFPR=1 THEN TN=253ANDTM=125
650 IFPR=2 THEN TN=254ANDTM=126
660 IF((P=TN)OR(P=TM)) GOTO630 E
LSE GOTO670
670 PRINT@133,"OK "P$(PR)" WHAT'
S THE ANSWER"
680 PRINT@204,"*******"
690 PRINT@236,"*     *"
700 PRINT@268,"*     *"
710 PRINT@300,"*     *"
720 PRINT@332,"*******"
730 IFPR=1 THEN JS=2 ELSE JS=0:A
Q=0
740 DM=JOYSTK(0)
750 IFJOYSTK(JS)<10 THEN AQ=4
760 IFJOYSTK(JS)>53 THEN AQ=2
770 IFJOYSTK(JS+1)<10 THEN AQ=1
780 IFJOYSTK(JS+1)>53 THEN AQ=3
790 PRINT@270,AQ" *"
800 P=PEEK(65280)
810 IF((P=255)OR(P=127)) GOTO740
820 IF(PR=1AND(P=126ORP=254)) GO
TO740
830 IF(PR=2AND(P=125ORP=253)) GO
TO740
840 RETURN
850 REM ** DISPLAY QUESTION & CH
OICES **
860 REM ** AND ANSWER **
870 CLS:PRINT@32,QN$
880 PRINT@99,"1 "A$(1)
890 PRINT@131,"2 "A$(2)
900 PRINT@163,"3 "A$(3)
910 PRINT@195,"4 "A$(4)
920 PRINT@419,"ANSWER IS NUMBER
"RA
930 PRINT@451,A$(RA)
940 IFRA=AQ THEN GOTO970
950 IFPR=2 THEN PR=1:GOTO970
960 IFPR=1 THEN PR=2
970 FORI=1TO2000:NEXT
980 RETURN
990 REM ** MAKE A MOVE **
1000 CLS:PRINT@130,P$(PR)" GETS
TO MOVE"
1010 FORI=1TO500:NEXTI
1020 SCREEN1,0
1030 P=PEEK(65280)
1040 IF(P=TN)OR(P=TM) THEN GOTO1
030 ELSE GOTO1050
1050 IFPR=1 THEN X2=2:X3=3:XX=LX
:YY=LY:X4=2:OX=RX:OY=RY:TN=253:T
M=125
1060 IFPR=2 THEN X2=0:X3=1:XX=RX
:YY=RY:X4=3:OX=LX:OY=LY:TN=254:T
M=126
1070 GOSUB1120
1080 IFPR=1 THEN XX=LX:YY=LY
1090 IFPR=2 THEN XX=RX:YY=RY
```

```
1100 RETURN
1110 REM ** MOVE PIECE ON BOARD
**
1120 PP=PPOINT(XX-15,YY-15)
1130 PP$=STR$(PP)
1140 DM=JOYSTK(0)
1150 IFJOYSTK(X2)<10 GOTO1200
1160 IFJOYSTK(X2)>53 GOTO1210
1170 IFJOYSTK(X3)<10 GOTO1220
1180 IFJOYSTK(X3)>53 GOTO1230
1190 GOTO1140
1200 DR$="BM"+STR$(XX)+","+STR$(
YY)+";BU6C"+PP$+"U6R1D6BD12D6L1U
6BU6BL6C8L6U1R6BR12C"+PP$+"R6D1L
6":DR=4:GOTO 1240
1210 DR$="BM"+STR$(XX)+","+STR$(
YY)+";BU6C"+PP$+"U6R1D6BD12D6L1U
6BU6BL6L6U1R6BR12C8R6D1L6":DR=2:
GOTO 1240
1220 DR$="BM"+STR$(XX)+","+STR$(
YY)+";BU6C8U6R1D6BD12C"+PP$+"D6L
1U6BU6BL6L6U1R6BR12R6D1L6":DR=1:
GOTO 1240
1230 DR$="BM"+STR$(XX)+","+STR$(
YY)+";BU6C"+PP$+"U6R1D6BD12C8D6L
1U6BU6BL6C"+PP$+"L6U1R6BR12R6D1L
6":DR=3
1240 DRAW DR$
1250 P=PEEK(65280)
1260 IF((P=255)OR(P=127)) THENGO
TO1120
1270 IF((P=TN)OR(P=TM)) THEN GOT
O1280 ELSE GOTO1120
1280 IFOL(PR)=1 THEN OL(PR)=X4
1290 ON DR GOTO1300,1370,1440,15
10
1300 IF(YY-32)<0 GOTO1120
1310 IF(XX=OX)AND(YY-32=OY) THEN
 GOTO1120
1320 NW(PR)=PPOINT(XX,YY-32)
1330 YY=YY-32
1340 CIRCLE(XX,YY),6,X4
1350 PAINT(XX,YY+32),OL(PR),8
1360 GOTO1570
1370 IF(XX+32)>256 GOTO1120
1380 IF(XX+32=OX)AND(YY=OY) THEN
 GOTO1120
1390 NW(PR)=PPOINT(XX+32,YY)
1400 XX=XX+32
1410 CIRCLE(XX,YY),6,X4
1420 PAINT(XX-32,YY),OL(PR),8
1430 GOTO1570
1440 IF(YY+32)>192 GOTO1120
1450 IF(XX=OX)AND(YY+32=OY) THEN
GOTO 1120
1460 NW(PR)=PPOINT(XX,YY+32)
1470 YY=YY+32
1480 CIRCLE(XX,YY),6,X4
1490 PAINT(XX,YY-32),OL(PR),8
1500 GOTO1570
1510 IF(XX-32)<0 GOTO1120
1520 IF(XX-32=OX)AND(YY=OY) THEN
 GOTO1120
1530 NW(PR)=PPOINT(XX-32,YY)
1540 XX=XX-32
1550 CIRCLE(XX,YY),6,X4
1560 PAINT(XX+32,YY),OL(PR),8
1570 PAINT(XX,YY),X4,X4
1580 IFNW(PR)=1 THEN SC(PR)=SC(P
R)+1
1590 IFPR=1 THEN LX=XX:LY=YY
1600 IFPR=2 THEN RX=XX:RY=YY
1610 FORI=1TO2000:NEXT
1620 OL(PR)=NW(PR)
1630 RETURN
1640 REM **   END   **
1650 CLS:PRINT@5,"FINAL SCORE"
1660 PRINT@131,SC(1)" POINTS FOR
 "P$(1)
1670 PRINT@163,SC(2)" POINTS FOR
 "P$(2)
1680 FORJJ=1TO6000:NEXTJJ
1690 SCREEN1,0
1700 RETURN
1710 REM **  QUESTIONS   **
1720 DATA"DONALD DUCK LIVES IN "
,2,"METROPOLIS","DUCKBURG","SMAL
LVILLE","MOTOWN"
1730 DATA"ROY ROGER'S HORSE WAS"
,4,"NELLYBELLE","BULLET","BUTTER
CUP","TRIGGER"
1740 DATA"HIS MOST HOMERS IN A Y
EAR WAS 60",1,"BABE RUTH","HANK
AARON","ROGER MARIS","MICKEY MAN
TLE"
1750 DATA"BOB NEWHART'S ROBERT H
ARTEY WAS A ",1,"PSYCHOLOGIST","
PILOT","PSYCHIATRIST","DENTIST"
1760 DATA"THINGS FELL ON FIBBER
MAGEE WHEN HE OPENED HIS",3,"GAR
AGE","MOUTH","CLOSET","FRONT DOO
R"
1770 DATA"THE 1ST RELATIVE OF AL
EX HALEY IN THE U.S. WAS",3,"DUR
WOOD KIRBY","KELLY FREAS","KUNTA
 KINTE","KUBLA KHAN"
1780 DATA"PHIL SILVERS PLAYED HI
M",1,"SGT BILKO","SGT PEPPER","S
GT FRIDAY","SGT SAUNDER"
1790 DATA"THE ENSLAVED PEOPLE IN
 H.G.WELL'S TIME MACHINE",2,"MOR
LOCKS","ELOI","ELRON","REMULACKS
"
1800 DATA"THE HUNTER WHO CHASES
BUGS BUNNY",4,"DAFFY DUCK","TOM
CAT","ROBIN WILLIAMS","ELMER FUD
D"
1810 DATA"DICK TRACY'S WIFE",3,"
GRAVEL GERTY","SPARKLE PLENTY","
TESS TRUEHEART","MOONBEAM MCSWAI
```

```
N"
1820 DATA"FURTHEST SOUTH STATE",
1,"HAWAII","CALIFORNIA","TEXAS",
"FLORIDA"
1830 DATA"LOCATON OF U.S. AIR FO
RCE ACADEMY",4,"WEST POINT","ANN
APOLIS","NEW LONDON","COLORADO S
PRINGS"
1840 DATA"WHICH IS THE PAPER ANN
IVERSARY",3,"5TH","10TH","1ST","
2ND"
1850 DATA"NOT A FICTIONAL DETECT
IVE",2,"NERO WOLF","ARCHIE ANDRE
WS","PHILO VANCE","NICK CARTER"
1860 DATA"DID NOT KILL A U.S. PR
ESIDENT",1,"JAMES EARL RAY","JOH
N WILKES BOOTH","CHARLES J. GUIT
EAU","LEON CZOLGOSZ"
1870 DATA"CAPITOL OF AUSTRALIA",
4,"SYDNEY","MELBOURNE","BRISBANE
","CANBERRA"
1880 DATA"NOT A MEMBER OF THE BU
MSTEADS",3,"COOKIE","ALEXANDER",
"HERB","BLONDIE"
1890 DATA"NICKNAME WAS BANJOEYES
",1,"EDDIE CANTOR","ED WYNNE","F
RED ALLEN","MILTON BERLE"
1900 DATA"NOT ONE OF BATMAN'S MA
IN ENEMIES",3,"JOKER","RIDDLER",
"LEX LUTHER","PENGUIN"
1910 DATA"PLAYS HOME GAMES IN TH
E KINGDOME",2,"TIGERS","MARINERS
","ASTROS","TWINS"
1920 DATA"SCROOGE MCDUCK'S FOES"
,2,"IRS","BEAGLE BOYS","CLANCY B
ROTHERS","IRA"
1930 DATA"A FORMER BEATLE",1,"PE
TER BEST","CHARLIE WATTS","TONY
SHERIDAN","BRIAN EPSTEIN"
1940 DATA"BIG BOPPER'S BIGGEST H
IT",2,"OH DONNA","CHANTILLY LACE
","THAT'LL BE THE DAY","RUBBER B
ALL"
1950 DATA"WHICH IS NOT A BOROUGH
 OF NEW YORK",2,"QUEENS","LONG I
SLAND","MANHATTAN","BRONX"
1960 DATA"BARRY GOLDWATER'S RUNN
ING MATE IN 1964",2,"HOWARD SMIT
H","WILLIAM E. MILLER","WILLIAM
J. BRYAN","LAURENCE SCHWEICKER"
1970 DATA"PLAYED MINNESOTA FATS
IN THE HUSTLER",4,"PAUL NEWMAN",
"WILLIE MASCONI","CHARLES LAUGHT
ON","JACKIE GLEASON"
1980 DATA"TOM SAWYER'S AUNT",1,"
AUNT POLLY","AUNT NANCY","AUNT E
ATER","AUNTIE EM"
1990 DATA"QUICK DRAW MCGRAW'S SI
DEKICK",1,"BABA-LOOEY","DOGGIE D
ADDY","BOO BOO","JOSE AWAY"
2000 DATA"JOE FRIDAY'S BADGE NUM
BER",1,"714","609","2211","744"
2010 DATA"BABE RUTH'S NICKNAME",
1,"BAMBINO","IRON MAN","SPENDID
SPLINER","BIG TRAIN"
2020 DATA"WHICH MOVIE IS THE OLD
EST",3,"SOUND OF MUSIC","IN THE
HEAT OF THE NIGHT","BEN-HUR","PA
TTON"
2030 DATA"SITE OF THE ANNUAL SOA
P BOX DERBY",2,"TOLEDO","AKRON",
"CINCINATTI","COLUMBUS"
2040 DATA"MAD MAGAZINE'S COVER B
OY",1,"ALFRED E. NEUMAN","JOHN D
OE","WILLIAM F. GAINES","HOWARD
SLUSHER"
2050 DATA"HENRY MITCHELL'S SON",
3,"BILLY","RYDER","DENNIS","JONI
"
2060 DATA"NOT AN ALOU BROTHER",1
,"ROBERTO","MATTY","JESUS","FELI
PE"
2070 DATA"WHO WAS AMERICA'S SWEE
THEART",2,"ALICE COOPER","MARY P
ICKFORD","FANNY BRICE","CLARA BO
W"
2080 DATA"COMIC IN WHICH SUPERMA
N 1ST APPEARED",4,"WHIZ","MARVEL
","SUPERBOY","ACTION"
2090 DATA"NOT A SON OF BEN CARTW
RIGHT",4,"JOE","ADAM","HOSS","BI
LL"
2100 DATA"LATE HEAD MAN OF MURDE
R INC.",3,"AL CAPONE","BUGSY SIE
GAL","ALBERT ANASTASIA","MICHAEL
 CORLEONE"
2110 DATA"THE SONG BOGIE WANTED
SAM TO PLAY IN CASABLANCA",2,"SM
OKE GETS IN YOUR EYES","AS TIME
GOES BY","DEEP PURPLE","MISTY"
2120 DATA"SHIRLEY MACLAINE'S BRO
THER",2,"DON MCLEAN","WARREN BEA
TTY","JAMES TAYLOR","BERT REYNOL
DS"
2130 DATA"MALE STAR IN THE MOVE
'THE BLOB'",3,"FRANKIE AVALON","
RAY MILLAND","STEVE MCQUEEN","GO
DFREY CAMBRIDGE"
2140 DATA"HOME OF BASEBALL'S NEW
 YORK GIANTS",4,"CANDLESTICK PAR
K","EBBETTS FIELD","COMISKEY PAR
D","POLO GROUNDS"
2150 DATA"DISCOVERER OF KING TUT
'S TOMB",3,"ROBIN ELLIS","WILLIA
M J. REYNOLDS","HOWARD CARTER","
LON CHANEY JR."
2160 DATA"HOSTED THE COLLEGE BOW
L",2,"GEORGE PLIMPTON","ALAN LUD
DEN","BOB BARKER","JACK BAILEY"
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FLAUNT YOUR COCO WITH SEASON'S GREETINGS CARDS

BY JOSEPH KOLAR

The purpose of this program is twofold. First, the object is to create either a Christmas or Easter greeting card. The second is to flaunt our CoCo in the faces of our friends, relatives and acquaintances.

Too often, when we prattle on about "my" CoCo, we must contend with a wary and skeptical audience. They realize they are in for a sustained one-way conversation, extolling the awesome power of the Color Computer. All they can hope for is to nod sagaciously and head for the nearest exit at the first opportunity. You are left standing, feeling inadequate, suspecting that you haven't gotten your message across.

The same scene reoccurs when we give a demonstration of the capabilities of the CoCo.

If you haven't heard this one, you haven't demonstrated your CoCo to a friend or relative who is unfamiliar or uneasy in the presence of a computer. "But, what else can it do?" I hate that question!

We have an opportunity to be diabolic. With the advent of the Christmas season, we can create, print and send personalized greeting cards to all, and I mean all, of our friends and relatives.

Outside of being a greeting card which can be displayed with all the store-bought cards, it will proclaim a silent message. To wit: "This is an example of what I can create on the CoCo." In some households it will become a conversation piece. I can't think of a more subtle way to proselytize for the CoCo.

To work! This program has no menu. "Mask" will mean to place a *REM* marker in front of an option program line. "Unmask" will mean to delete the *REM* marker at the beginning of an option program line.

We will mask certain program lines to delete them from the program. We will unmask a program line to use a particular option.

Figure 1



There are two backgrounds. Mask Line 45 and you will select the "shining light" background that is suited for either the pigeon or Santa. If you unmask Line 45, you will get a small cross on a circle background. Use this option if you would rather use the addressee's name only.

The areas that will have pictures of printed matter superimposed on the background must be blanked out.

To print "SEASON'S GREETINGS," unmask program Lines 137 and 138 to blank out the background. Unmask Lines 190 and 191 to print "SEASON'S GREETINGS." Use this to create Figure 1.

To print "MERRY CHRISTMAS AND A HAPPY NEW YEAR," unmask Lines 135, 136, 140 and 141 to blank out the background. Unmask Lines 145, 150, 170, 180, and 181 to print "MERRY CHRISTMAS AND A HAPPY NEW YEAR." This format is not demonstrated. The challenge is that if you can create this card you will know you understand this technique.

(Joseph Kolar is a free-lance writer and programmer dedicated to proselytizing for computers in general, and the CoCo specifically.)

To print "HAPPY EASTER," unmask Lines 137 and 138 to blank out the background. Unmask Lines 192 and 193 to print "HAPPY EASTER."

All the options are Lines 45 and the lines in the program listing from 134 to 193. Look at the listings to verify what each line does. Naturally, lines not used in your desired creation must be masked with the *REM* marker so they will not be part of the card.

Because the addressee's name or names and the signature name or names are variable in width, it will be necessary to locate and adjust the width of the blanked out background for both.

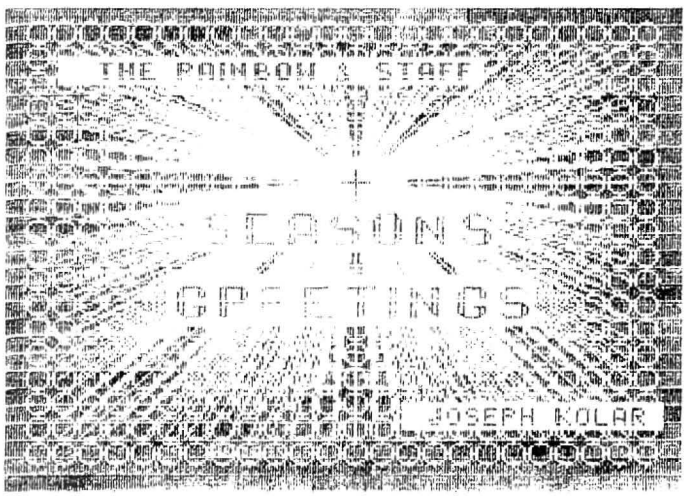
Unmasking program Line 134 blanks out the addressee's line. Unmasking program Lines 143 and 144 print the addressee's name. If the name is short, Line 144 may not be needed. Mask it if you don't need it.

Unmask Line 142 and it will blank out the signature line. Unmask Line 160 and 161 to print the signature. Again, if the name is short you may not require Line 161 and by now, you know what to do.

This is the most difficult part of the program – adjusting and locating the name/names.

There are two alphabets that you may use, a regular and fancy alphabet. The regular alphabet has a "K" as the first letter of the two-letter variable. The fancy alphabet uses a "D" as the first letter of the variable. The second letter of the variable is the literal name of the character. Numerals and some punctuation are included. See the listing for the proper variables. Each variable must have "$" as the third and final element. SS$ is the variable to use with either alphabet to

Figure 2



space between words or names. AA$ is the ampersand, if you prefer to use it rather than "AND" in either alphabet.

You need not key in the numerals in the listing, if you do not expect to use them.

Both the addressee and signature lines may be printed using either of the two alphabets. You may want to use a fancy alphabet letter to indicate a capital letter and regular letters to indicate small letters. (See program Line 160.)

The names are printed using concatenation. In *DRAW* statements (see Line 160), use S4 for the size. Locate it horizontally and vertically. Do not change any vertical locations in any line. Then, print a fancy "J," DJ$; a regular "O," KO$; etc. Note SS$ separates the two names of the signature.

Remember to concatenate each letter you print by prefixing a + in front of each variable.

To locate the addressee and signature lines, we will concentrate our explanation on the addressee line.

To locate, move, widen or close in the left or right sides of the blank out for the addressee (Line 134), manipulate only the two horizontal components. To print the name/names, manipulate the horizontal component of the *DRAW* statement (Line 143). Line 144 is a continuation line and does not require any locating elements.

This operation must be done by trial and error. After all, each addressee's name or names will be different in length. Let us address the card to "THE RAINBOW & STAFF." We must expand the width of the blanked out area from horizontal 70 to horizontal 200.

```
134  LINE(70,20)-(200,30),PRESET,BF
```

This gives us a working area to make a trial printing.

Program Line 143 must begin after 70 to leave a space on the left side. Key in Line 143.

```
143  DRAW
"S4C0BM70,28"+KT$+KH$+KE$+SS$+KR$+KA$+KI$
  +KN$+KB$+KO$+KW$
```

If you continue concatenating, you will soon get an L/S error message. In that case, lop off the last variable and *RUN*. If it is okay, begin a new *DRAW* program line without the info between the quote marks and continue with the next letter.

```
144  DRAWSS$+AA$+SS$+KS$+KT$+KA$+KF$+KF$
```

Remember, (space), (ampersand), (space), etc. When this is *RUN*, the "STAFF" runs on top of the background. We must widen the blank out space so that the space ends after the last "F" in "STAFF."

Change the horizontal location 200 in Line 134 to 220. *RUN*.

Note that we have used the regular alphabet exclusively. There is no reason why we couldn't capitalize. Change the "K"s in KT$, KR$ and KS$ to "D"s.

For demonstration purposes, if you wanted to move the addressee line a bit to the right, you could manipulate the horizontal location in Line 143 to 85 and *RUN*. If you wanted more blank space at the end of the addressee's line, extend Line 134 by changing horizontal 220 to 225 or 230.

Of course, you could use all fancy letters. In that case, change all the "K"s in Lines 143 and 144 to "D"s.

When you get the addressee line set to your liking, you can perform a similar set of trial operations on the signature line. Unmask Line 142 to blank out the signature line. Unmask Line 160 to print the signature. If you have a very long signature add Line 161.

Once you get your signature line set up, you need not bother with it anymore, unless you use a variety of signatures. For example, Joe; Joseph; Joseph Kolar.

Make any final horizontal adjustments in the addressee line, both blank out and lettering. Check it until it looks right to you. Finally, if you have a printer, run off a sample.

Use reverse printing if you use the shining light background. Use either regular or reverse printing for the other background.

If you use the alternate background, unmask Line 45. Mask Lines 92, 95 and 96. Move the addressee block to the left (see Figure 2). This will give you a little practice moving the addressee block. If you were moving it to horizontal 20, you would subtract 50 from all of the horizontal locators.

Line 134: 70-50=20 and 230-50=180. Line 143: 85-50=35. Even then, you might want to make further adjustments to suit yourself.

Figure 3



Figure 3 shows an Easter card. It would be created as follows:

Mask Line 45. Unmask Lines 92 and 95. Mask Line 96. Mask Lines 190 and 191. Unmask Lines 192 and 193. Lines 134 and 143 must be moved over to the left. The horizontal locators should be 100 and 250 in Line 134 and 105 in Line 143.

Of course, you would mask lines that you would not need.

Note that it was necessary to shorten the right blank out to 100 rather than 90 to avoid overlapping the olive branch.

After printing copies of Santa cards, you might want to use a red pencil to shade in Santa's clothing to add a little color.

There is only one way to end this — Merry Christmas And A Happy New Year!

```
110.. 01CE
181... 0559
10300 .. 097F
30030 ..0DA0
40410 .. 1379
END ... 1711
```

Listing 1

```
0 'FIGURE 1
1 CLEAR 500
5 FOR I= 1 TO 5:PRINT:NEXT
10 PRINT TAB(3)"COMBO-A X-MAS/EA
STER CARD
15 PRINT TAB(10)"JOSEPH KOLAR"
20 PRINT TAB(7)"INVERNESS, FLORI
DA"
25 SCREEN 0,1:FOR Z= 1 TO 2000:N
EXT
35 PRINT:INPUT"          PRESS <E
NTER>";A0
40 PMODE 4,1:PCLS:SCREEN 1,1
45 'GOTO 51000'EASTER/CHRISTMAS
 CENTERED BACKGROUND
50 FOR X= 0 TO 256 STEP 8
60 FOR Y=0 TO 192 STEP 8
70 LINE (0,0)-(X,Y),PSET
80 NEXT Y:SOUND 100,1
85 NEXT X
90 '
91 COLOR 0,1
92 LINE(0,0)-(100,50),PRESET,BF
95 'GOTO 20000'PIGEON
96 GOTO 30000'SANTA
100 '
110 GOTO 10000
120 '
130 COLOR 0,1
134 LINE(70,20)-(230,30),PRESET,
BF'ADDRESSEE BLANK-OUT
135 'LINE(110,103)-(155,113),PRE
SET,BF' AND A BLANK-OUT
136 'LINE(75,123)-(185,133),PRES
ET,BF' HAPPY NEW YEAR BLANK-OUT
137 LINE(69,78)-(185,98),PRESET,
BF' SEASONS AND HAPPY BLANK-OUT
138 LINE(61,108)-(199,128),PRESE
T,BF'GREETINGS AND EASTER BLANK-
OUT
140 'LINE(108,70)-(147,80),PRESE
T,BF' MERRY BLANK-OUT
141 'LINE(95,80)-(161,95),PRESET
,BF' CHRISTMAS BLANK-OUT
142 LINE(150,160)-(248,170),PRES
ET,BF
143 DRAW "S4C0BM85,28"+DT$+DH$+D
E$+SS$+DR$+DA$+DI$+DN$+DB$+DO$+D
W$
144 DRAW SS$+AA$+SS$+DS$+DT$+DA$
+DF$+DF$
145 'DRAW "S4BM110,78"+KM$+KE$+K
R$+KR$+KY$ 'MERRY
150 'DRAW"BM100,93"+KC$+KH$+KR$+
KI$+KS$+KT$+KM$+KA$+KS$' CHRISTM
AS
160 DRAW "S4BM160,168"+DJ$+KO$+K
S$+KE$+KP$+KH$+SS$+DK$+KO$+KL$+K
A$+KR$' SIGNATURE LINE
170 'DRAW"BM114,111"+KA$+KN$+KD$
+SS$+KA$'AND A
180 'DRAW "BM80,131"+KH$+KA$+KP$
+KP$+KY$+SS$+KN$+KE$+KW$+SS$' HA
PPY NEW
181 'DRAW KY$+KE$+KA$+KR$'YEAR
190 DRAW "S8BM75,95"+DS$+DE$+DA$
+DS$+DO$+DN$+DS$'SEASONS
191 DRAW "BM65,125"+DG$+DR$+DE$+
DE$+DT$+DI$+DN$+DG$+DS$'GREETING
S
192 'DRAW "S8BM94,95"+DH$+DA$+DP
$+DP$+DY$'HAPPY
193 'DRAW "BM87,125"+DE$+DA$+DS$
+DT$+DE$+DR$'EASTER
200 GOTO 200
10000 '
10010 KA$="U5ER2FD3NL4D2BR3"
10020 KB$="U6R3FDGNL3FDGNL3BR5"
10030 KC$="NRHU4ER2FBD4GNL2BR4"
10040 KD$="U6R3FD4GNL3BR4"
```

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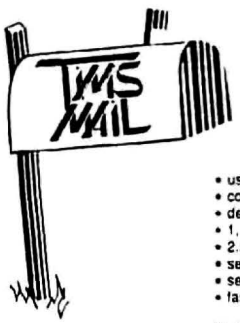
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Also you may record a vocal or musical introduction preceeding your program. The Auto Run loader will control the audio on/off.

Basic programs can be set to load anywhere in memory above the PCLEAR 0 page.

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Price includes complete documentation and assembly source listing.

Requires 16K Extended Basic

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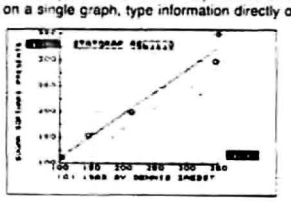
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```
10050 KE$="NR4U3NR3U3R4BD6BR3"
10060 KF$="U3NR3U3R4BD6BR3"
10070 KG$="BRHU4ER2FBD3NLDGNL2BR
4"
10080 KH$="U3NU3R4NU3D3BR3"
10090 KI$="NU6BR3"
10100 KJ$="BUNUFR2ENU5BDBR3"
10110 KK$="U3NU3R2E2UBD3BL2F2DBR
3"
10120 KL$="NU6R4BR3"
10130 KM$="U6F3E3D6BR3"
10140 KN$="U5NUF4NU5DBR3"
10150 KO$="BRNR2HU4ER2FD4GBR4"
10160 KP$="U6R3FDGNL3BF3BR"
10170 KQ$="BRHU4ER2FD4GLNUNDNLBR
5"
10180 KR$="U6R3FDGL2NLF3BR3"
10190 KS$="BUFR2EUHL2HUER2FBD5BR
3"
10200 KT$="BR2U6NL2R2BD6BR3"
10210 KU$="BRHU5BR4D5GNL2BR5"
10220 KV$="BR2H2U4BR4D4G2BR5"
10230 KW$="BUNU5FE2F2ENU5BR3BD"
10240 KX$="UE2H2UBR4DG2F2DBR3"
10250 KY$="BR2U3H2UBR4DG2BF3BR2"
10260 KZ$="NR4UE4UNL4BF3BD3"
10270 SS$="BR6" 'SPACE
10280 CM$="NUNGBR3" 'PERIOD
10290 DT$="RBR3"
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```
10300 XC$="UBU2U3BD6BR3" 'EXCLAM
ATION POINT
10310 K1$="BRU6NGBD6BR3"
10313 AA$="BR4M-3,-4UEFDG3DFRE2B
F2BR3BU" 'AMPERSAND
10320 K2$="BU6R3FD2GL3D2R4BR3"
10330 K3$="BU6R3FDGNL2FDGNL3BR4"
10340 K4$="BU6D4R3NU4NRD2BR4"
10350 K5$="R3EU2HL3U2R4BD6BR3"
10360 K6$="BUNUFR2EUHL2GU3ER2FBD
5BR3"
10370 K7$="BU6R4D3GD2BR4"
10380 K8$="BRHUEHUER2FDGNL2FDGNL
2BR4"
10390 K9$="BUFR2EU4HL2GDFR2EBD4B
R3"
10400 K0$=KO$
10410 GOTO 40000
20000 '
20010 DRAW "C0S8BM6,6R2M+2,+1UM+
2,+1UM+2,+1NM+3,+4U2FE M+5,+8R3M
+5,+1NM+7,+1HNR4U2NR4M-1,-2NR4M-
1,-2NR4EM-2,-1 R3M+9,+4M+2,+1D2G
3 R3DF3BU4BL3E3R2F2DF2L2 DM-2,+3
G3M-4,+2M-4,+1"
20020 DRAW"L3FLHL2FLHM+2,-1M+4,-
1M+2,-1U2M-2,-1 BG6L M-2,-1M-5,-
2M-5,-2M-5,-4 M+2,-1NF4M+3,-1NF4
R2ENF4R3M+4,+3M+3,+2 BU5BL7H2M-4
,-3M-6,-4"
20030 DRAW "BM90,29M-1,+4EUERDGL
GM-1,+4RUERDGL2M-4,+5"
20040 DRAW "BM90,29UHUEFDGDEU2EU
ERDGLGU3HUEFDG"
20050 DRAW "BM82,23DL"
20060 GOTO 100
30000 '
30010 DRAW "C0S8BM15,20U2RU2E4R5
F2NRL3G4NDU3NEG2LDLFDL2 BR5BUREN
R2NFE2R4NU2NDF3D4G3LLDHL3M-3,-2U
3M+1,-2 BFDFNE2RNR4FR2ENH2EUBL2N
UL3EBUNLBRNFR2BUHGH"
30020 DRAW "BD8BL5G3D3ND2R3NU2NF
4D2L2NLDGDRNURNURNURUHUF4R4NU2R2
NU2RE5NFHG4NH3L7R7E4 NU3E2NU2RER
UNLUNLR2UL3G2LGL2NF2H2L"
30030 GOTO 100
40000 DA$="NRU5END6R3D4NL3D2RU5H
BR4BD6"
40010 DB$="NRU6RND6R2FDGNL2RFDGN
L3BR4"
40020 DC$="BUNFU4END6R3ND2FDNLBD
2NLDGNU2NL3BR4"
40030 DD$="NRU6RND6R3FD4GNL3BR4"
40040 DE$="NRU6RNR3D3NR2D3R4BR3"
40050 DF$="NRU6RNR3D3NR2D3BR6"
40060 DG$="BUNFU4END6R3ND2FDNLBD
2NL2DGNU2NL3BR4"
40070 DH$="NRU6RND6BR3NRD3NL3D3R
NU6BR3"
```

```
40080 DI$="NRU6RD6BR3"
40090 DJ$="BUNFURD2R2U6RD5GBR4"
40100 DK$="NRU6RD3RNE3NF3LD3BR7"
40110 DL$="NRU6RD6R3BR3"
40120 DM$="NRU6RND6M+2,+3M+2,-3N
D6RD6NLBR3"
40130 DN$="NRU6FND5M+3,+4U5RD6NH
BR4"
40140 DO$="BUNFU4END6R3ND6FD4GNL
3BR4"
40150 DP$="NRU6RND6R3ND3FDGNL3BD
3BR4"
40160 DQ$="BUNFU4END6R3ND6FD4GLN
L2NHFBUBR4"
40170 DR$="NRU6RND6R3ND3FDGL2NLF
3BR3"
40180 DS$="BU4NFUEND3R3FBD3HNL3F
DGNU3L3HBDBR8"
40190 DT$="BR2NRU6NL2RNR2D6BR5"
40200 DU$="BUNFU5RD6R3U6RD5NGBR4
BD"
40210 DV$="BU3NFU3RD4FDRUE2U3LD4
BD2BR4"
40220 DW$="NRU6RD6M+2,-3M+2,+3U6
RD6NLBR3"
40230 DX$="UNEBU4NFURD2NM+3,+2BD
2NM+3,-2D2NLBR3U2BU2U2RDNGBD4HD2
RNUBR3"
40240 DY$="BU4NFU2RD3RNRD3RU3RU3
RD2GBD3BR4"
40250 DZ$="BU6R4ND2RDGM-3,+2ND2G
DR5BR3"
40260 DO$=DO$:D1$=DI$
40270 D2$="BU5ER3ND3FDGL3GD2RNU3
R4BR3"
40280 D3$="BU5ER3ND3FDGNL3ND3FDG
L3NHBR8"
40290 D4$="BU3NFU3RD4R2NU4NR2D2B
R5"
40300 D5$="BUFR3NU3EUHL3HU2RND3R
3BD6BR4"
40310 D6$="BUNFU4END6R3FBD3NDHL2
GD2R3NEBR4"
40320 D7$="BU6R5G3D3RNU4BR5"
40330 D8$="BRNR3HUENR3HUEND6R3ND
6FDGFDGBR5"
40340 D9$="BUFR3NU6EU4HL3GDFR3BR
4BD3"
40350 MP$="URDNLBR3"'PERIOD
40360 MS$="BR3"'SMALL SPACE
40370 MM$="URDNLGBUBR3"'COMMA
40380 MA$="BU6URDNLGBD5BR3"'APOS
TROPHE
40390 MN$="BUURDLUBU2URDLBD4BR4"
'COLON
40400 MX$="URDLUBU2U3RD3NLBD3BR3
"'EXCLAM. PT.
40410 GOTO 120
50000 '***INFORMATION***
50010 '*** CHANGE THE <'> ON
```


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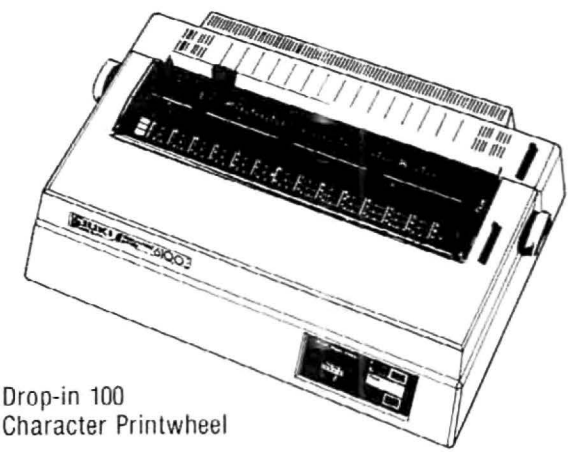
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MDISK — Hal Snyder's latest breakthrough for the 64K Color Computer! MDISK lets you use the upper 32K of memory for rapid storage and retrieval of programs and data. Whether you own an actual disk drive or not, MDISK puts the "hidden" 32K to work for you as a "virtual disk," with capability to save and load up to 15 programs, view a directory of files stored in "page 1," kill unwanted page 1 files, execute BASIC or machine language directly from MDISK, chain to a BASIC program while preserving data already created, and more. These functions are available not only under manual keyboard control, but from programs in progress as well, permitting high-speed swapping of programs or data. Unlike many 64K utilities, MDISK doesn't copy BASIC to RAM. This greatly increases the amount of workspace available to you (by 22K in a disk system). MDISK is written in position independent code, and will work on disk or tape based 64K systems. Full documentation included. **Cassette $27.95 Disk $29.95**

ROMBACK — Why pay more? The easiest to use ROM-pak dumping utility available! At the best price, too! Comes with full documentation, including detailed patching instructions to allow several popular "problem" cartridges to run from tape or disk. Stop plugging and unplugging your disk controller! Don't blow any more SAM chips or 6809Es! Use ROMBACK, and run those programs from tape or disk instead. Works with any 64K Extended BASIC system. **Cassette $16.95**

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64K BOOT/PAGER — The 64K Boot allows you to modify BASIC by moving it from ROM to RAM. The PAGER is a menu-driven utility allowing you to manually page between the 32K banks of memory, copying BASIC or data from one page to the other. The complete assembler source code for both programs is included. Both are written in position independent code and run on 64K tape or disk systems. **Cassette $19.95**

STRUCTURED MACROS — An assembly language programming tool for users of the Macro-80C assembler, by the Micro Works. Structured macros come close to transforming your assembler into a high-level language. Your programs become more understandable and debugging is simplified. Commands include IF, ELS, ENDIF, IFTST, IFCC, WHILE, ENDWH, REPEAT, and UNTIL. **Disk $19.95**

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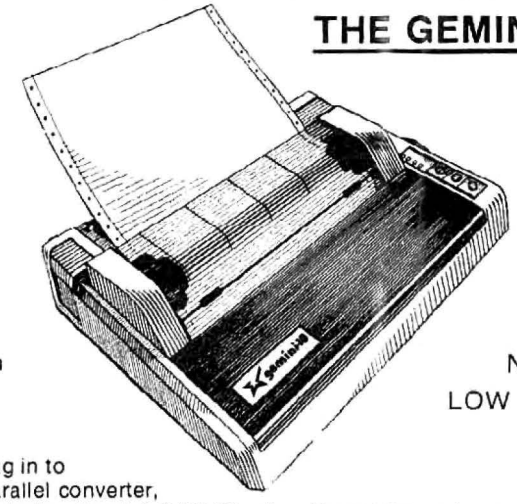
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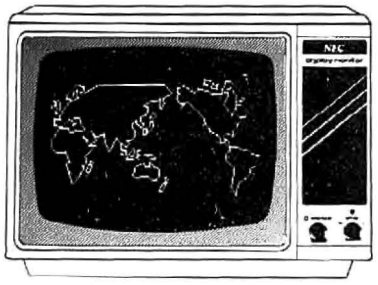
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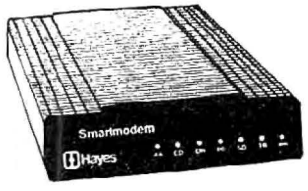
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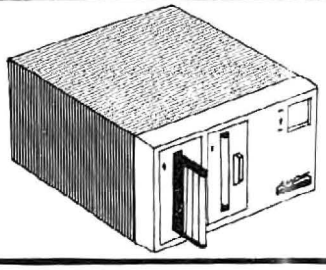
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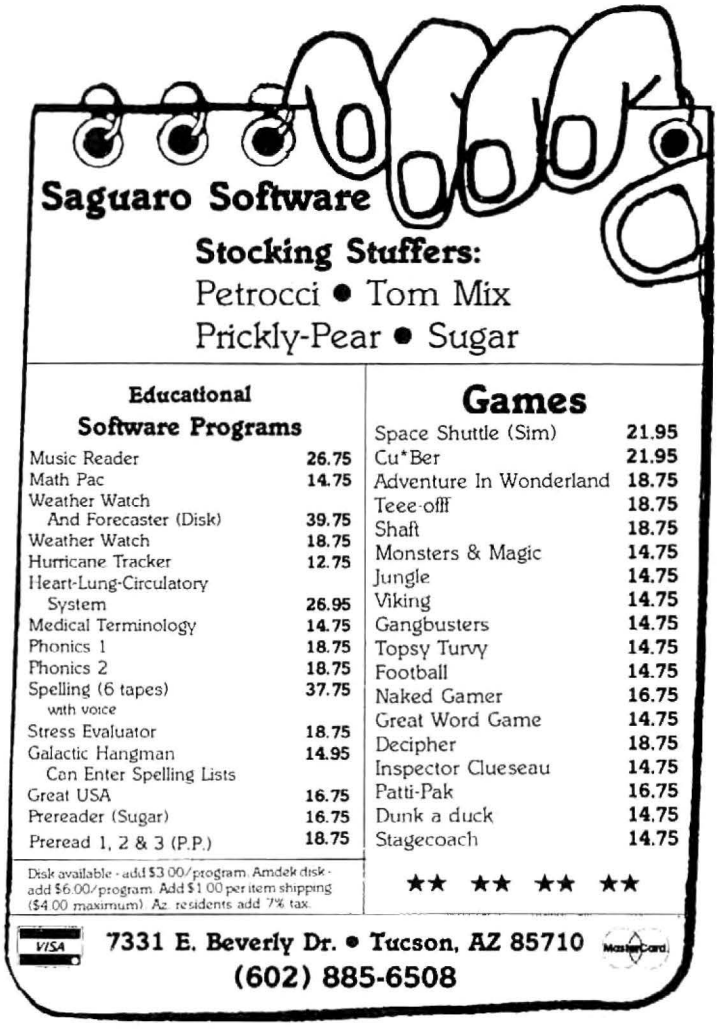
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```
LINES 92 AND 95 TO CHOOSE PIGEON
 OR LINES 92 AND 96 TO CHOOSE
SANTA.
50020 '*** LINES 190 AND 191 GET
'SEASONS GREETINGS'.
50030 '***LINE 192 AND 193 GET
'HAPPY EASTER',
50040 'USE WITH LINE 137 AND 138
WHICH IS THE BLANK-OUTS
50050 '***READ THE REM FROM LINE
134 THROUGH 193 FOR COMPLETE
BREAKDOWN!
51000 PMODE 4,1:PCLS:SCREEN1,0
51010 FOR X= 10 TO 245 STEP 10'R
OUTINE FOR CIRCLES
51020 FOR Y=10 TO 180 STEP 10
51030 'LINE(X+5,Y+3)-(X,Y),PSET,
B
51040 CIRCLE(X+2,Y),5,1
51050 NEXT Y,X
51180 FOR X= 132 TO 13 STEP-8'RA
YS FOURTH QUADRANT
51190 FOR Y= 70 TO 10 STEP-8
51200 LINE(132,70)-(X,Y),PSET
51210 NEXT Y,X
51220 FOR X=132 TO 240 STEP 8'RA
YS FIRST QUAD
51230 FOR Y=70 TO 10 STEP-8
51240 LINE(132,70)-(X,Y),PSET
51250 NEXT Y,X
51260 FOR X=132 TO 13 STEP-8'RAY
S THIRD QUAD
51270 FOR Y=70 TO 181 STEP 8
51280 LINE(132,70)-(X,Y),PSET
51290 NEXTY,X
51300 FOR X=132 TO 240 STEP 8'RA
YS SECOND QUAD
51310 FOR Y=70 TO 181 STEP 8
51320 LINE(132,70)-(X,Y),PSET
51330 NEXT Y,X
51335 DRAW"C0BM132,70NU5NL5NR5D8
"
51340 GOTO 90
51350 GOTO 51350
```


```
120...01DF
193... 0640
10280 ..094F
30030 ..0DAA
40410 .. 1383
END ...171B
```

Listing 2

```
0 'FIGURE 2
1 CLEAR 500
5 FOR I= 1 TO 5:PRINT:NEXT
10 PRINT TAB(3)"COMBO-A X-MAS/EA
STER CARD
15 PRINT TAB(10)"JOSEPH KOLAR"
20 PRINT TAB(7)"INVERNESS, FLORI
DA"
25 SCREEN 0,1:FOR Z= 1 TO 2000:N
EXT
35 PRINT:INPUT"          PRESS <E
NTER>";A0
40 PMODE 4,1:PCLS:SCREEN 1,1
45 GOTO 51000'EASTER/CHRISTMAS
CENTERED BACKGROUND
50 FOR X= 0 TO 256 STEP 8
60 FOR Y=0 TO 192 STEP 8
70 LINE (0,0)-(X,Y),PSET
80 NEXT Y:SOUND 100,1
85 NEXT X
90 '
91 COLOR 0,1
92 'LINE(0,0)-(100,50),PRESET,BF
95 'GOTO 20000'PIGEON
96 'GOTO 30000'SANTA
100 '
110 GOTO 10000
120 '
130 COLOR 0,1
134 LINE(20,20)-(180,30),PRESET,
BF'ADDRESSEE BLANK-OUT
135 'LINE(110,103)-(155,113),PRE
SET,BF' AND A BLANK-OUT
136 'LINE(75,123)-(185,133),PRES
ET,BF' HAPPY NEW YEAR BLANK-OUT
137 LINE(69,78)-(185,98),PRESET,
BF' SEASONS AND HAPPY BLANK-OUT
138 LINE(61,108)-(199,128),PRESE
```

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Inspector CLUEseau

Sherlock Holmes/Agatha Christie fans-It's finally here—A murder mystery game for the 80-C! Mr. Goodbody has been killed in his mansion and you must solve the mystery. WHO committed the murder, WHERE did it occur and HOW was it done! Question suspects, find the secret passage, and break the code to get clues. Hi-Res graphics enhances this excellent game. The computer records the clues you obtain on a clue inventory screen and also provides suspect descriptions at the touch of a finger. A fast, fun game that will sharpen your deductive skills. Every game is different!

32K Extended $19.95

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Save hours of tedious work with this efficient program. Calculates individual player average, high game and total pins, as well as team games won/lost, high series, and cumulative total team points. Also calculates team standings for each week in order from 1st to last! All data stores to tape and outputs to printer to provide professional, easy to read copy. After intitial input of league and player names all you have to do is input each week's scores - the computer does the rest!!!

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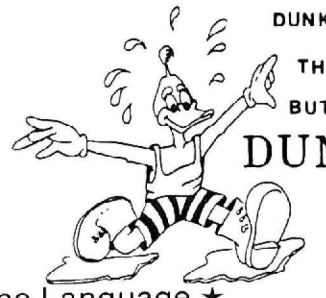
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```
T,BF'GREETINGS AND EASTER BLANK-
OUT
140 'LINE(108,70)-(147,80),PRESE
T,BF' MERRY BLANK-OUT
141 'LINE(95,80)-(161,95),PRESET
,BF' CHRISTMAS BLANK-OUT
142 LINE(150,160)-(248,170),PRES
ET,BF
143 DRAW "S4C0BM35,28"+DT$+DH$+D
E$+SS$+DR$+DA$+DI$+DN$+DB$+DO$+D
W$
144 DRAW SS$+AA$+SS$+DS$+DT$+DA$
+DF$+DF$
145 'DRAW "S4BM110,78"+KM$+KE$+K
R$+KR$+KY$ 'MERRY
150 'DRAW"BM100,93"+KC$+KH$+KR$+
KI$+KS$+KT$+KM$+KA$+KS$' CHRISTM
AS
160 DRAW "S4BM160,168"+DJ$+KO$+K
S$+KE$+KP$+KH$+SS$+DK$+KO$+KL$+K
A$+KR$' SIGNATURE LINE
170 'DRAW"BM114,111"+KA$+KN$+KD$
+SS$+KA$'AND A
180 'DRAW "BM80,131"+KH$+KA$+KP$
+KP$+KY$+SS$+KN$+KE$+KW$+SS$' HA
PPY NEW
181 'DRAW KY$+KE$+KA$+KR$'YEAR
190 DRAW "S8BM75,95"+DS$+DE$+DA$
+DS$+DO$+DN$+DS$'SEASONS
```


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```
191 DRAW "BM65,125"+DG$+DR$+DE$+
DE$+DT$+DI$+DN$+DG$+DS$'GREETING
S
192 'DRAW "S8BM94,95"+DH$+DA$+DP
$+DP$+DY$'HAPPY
193 'DRAW "BM87,125"+DE$+DA$+DS$
+DT$+DE$+DR$'EASTER
200 GOTO 200
10000 '
10010 KA$="U5ER2FD3NL4D2BR3"
10020 KB$="U6R3FDGNL3FDGNL3BR5"
10030 KC$="NRHU4ER2FBD4GNL2BR4"
10040 KD$="U6R3FD4GNL3BR4"
10050 KE$="NR4U3NR3U3R4BD6BR3"
10060 KF$="U3NR3U3R4BD6BR3"
10070 KG$="BRHU4ER2FBD3NLDGNL2BR
4"
10080 KH$="U3NU3R4NU3D3BR3"
10090 KI$="NU6BR3"
10100 KJ$="BUNUFR2ENU5BDBR3"
10110 KK$="U3NU3R2E2UBD3BL2F2DBR
3"
10120 KL$="NU6R4BR3"
10130 KM$="U6F3E3D6BR3"
10140 KN$="U5NUF4NU5DBR3"
10150 KO$="BRNR2HU4ER2FD4GBR4"
10160 KP$="U6R3FDGNL3BF3BR"
10170 KQ$="BRHU4ER2FD4GLNUNDNLBR
5"
10180 KR$="U6R3FDGL2NLF3BR3"
10190 KS$="BUFR2EUHL2HUER2FBD5BR
3"
10200 KT$="BR2U6NL2R2BD6BR3"
10210 KU$="BRHU5BR4D5GNL2BR5"
10220 KV$="BR2H2U4BR4D4G2BR5"
10230 KW$="BUNU5FE2F2ENU5BR3BD"
10240 KX$="UE2H2UBR4DG2F2DBR3"
10250 KY$="BR2U3H2UBR4DG2BF3BR2"
10260 KZ$="NR4UE4UNL4BF3BD3"
10270 SS$="BR6" 'SPACE
10280 CM$="NUNGBR3" 'PERIOD
10290 DT$="RBR3"
10300 XC$="UBU2U3BD6BR3" 'EXCLAM
ATION POINT
10310 K1$="BRU6NGBD6BR3"
10313 AA$="BR4M-3,-4UEFDG3DFRE2B
F2BR3BU"'AMPERSAND
10320 K2$="BU6R3FD2GL3D2R4BR3"
10330 K3$="BU6R3FDGNL2FDGNL3BR4"
10340 K4$="BU6D4R3NU4NRD2BR4"
10350 K5$="R3EU2HL3U2R4BD6BR3"
10360 K6$="BUNUFR2EUHL2GU3ER2FBD
5BR3"
10370 K7$="BU6R4D3GD2BR4"
10380 K8$="BRHUEHUER2FDGNL2FDGNL
2BR4"
10390 K9$="BUFR2EU4HL2GDFR2EBD4B
R3"
10400 KO$=KO$
10410 GOTO 40000
```

```
20000 '
20010 DRAW "C0S8BM6,6R2M+2,+1UM+
2,+1UM+2,+1NM+3,+4U2FE M+5,+8R3M
+5,+1NM+7,+1HNR4U2NR4M-1,-2NR4M-
1,-2NR4EM-2,-1 R3M+9,+4M+2,+1D2G
3 R3DF3BU4BL3E3R2F2DF2L2 DM-2,+3
G3M-4,+2M-4,+1"
20020 DRAW"L3FLHL2FLHM+2,-1M+4,-
1M+2,-1U2M-2,-1 BG6L M-2,-1M-5,-
2M-5,-2M-5,-4 M+2,-1NF4M+3,-1NF4
R2ENF4R3M+4,+3M+3,+2 BU5BL7H2M-4
,-3M-6,-4"
20030 DRAW "BM90,29M-1,+4EUERDGL
GM-1,+4RUERDGL2M-4,+5"
20040 DRAW "BM90,29UHUEFDGDEU2EU
ERDGLGU3HUEFDG"
20050 DRAW "BM82,23DL"
20060 GOTO 100
30000 '
30010 DRAW "C0S8BM15,20U2RU2E4R5
F2NRL3G4NDU3NEG2LDLFDL2 BR5BUREN
R2NFE2R4NU2NDF3D4G3LLDHL3M-3,-2U
3M+1,-2 BFDFNE2RNR4FR2ENH2EUBL2N
UL3EBUNLBRNFR2BUHGH"
30020 DRAW "BD8BL5G3D3ND2R3NU2NF
4D2L2NLDGDRNURNURNURUHUF4R4NU2R2
NU2RE5NFHG4NH3L7R7E4 NU3E2NU2RER
UNLUNLR2UL3G2LGL2NF2H2L"
30030 GOTO 100
```

```
40000 DA$="NRU5END6R3D4NL3D2RU5H
BR4BD6"
40010 DB$="NRU6RND6R2FDGNL2RFDGN
L3BR4"
40020 DC$="BUNFU4END6R3ND2FDNLBD
2NLDGNU2NL3BR4"
40030 DD$="NRU6RND6R3FD4GNL3BR4"
40040 DE$="NRU6RNR3D3NR2D3R4BR3"
40050 DF$="NRU6RNR3D3NR2D3BR6"
40060 DG$="BUNFU4END6R3ND2FDNLBD
2NL2DGNU2NL3BR4"
40070 DH$="NRU6RND6BR3NRD3NL3D3R
NU6BR3"
40080 DI$="NRU6RD6BR3"
40090 DJ$="BUNFURD2R2U6RD5GBR4"
40100 DK$="NRU6RD3RNE3NF3LD3BR7"
40110 DL$="NRU6RD6R3BR3"
40120 DM$="NRU6RND6M+2,+3M+2,-3N
D6RD6NLBR3"
40130 DN$="NRU6FND5M+3,+4U5RD6NH
BR4"
40140 DO$="BUNFU4END6R3ND6FD4GNL
3BR4"
40150 DP$="NRU6RND6R3ND3FDGNL3BD
3BR4"
40160 DQ$="BUNFU4END6R3ND6FD4GLN
L2NHFBUBR4"
40170 DR$="NRU6RND6R3ND3FDGL2NLF
3BR3"
```




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```
40180 D8$="BU4NFUEND3R3FBD3HNL3F
DGNU3L3HBDBR8"
40190 DT$="BR2NRU6NL2RNR2D6BR5"
40200 DU$="BUNFU5RD6R3U6RD5NGBR4
BD"
40210 DV$="BU3NFU3RD4FDRUE2U3LD4
BD2BR4"
40220 DW$="NRU6RD6M+2,-3M+2,+3U6
RD6NLBR3"
40230 DX$="UNEBU4NFURD2NM+3,+2BD
2NM+3,-2D2NLBR3U2BU2U2RDNGBD4HD2
RNUBR3"
40240 DY$="BU4NFU2RD3RNRD3RU3RU3
RD2GBD3BR4"
40250 DZ$="BU6R4ND2RDGM-3,+2ND2G
DR5BR3"
40260 DO$=D0$:D1$=D1$
40270 D2$="BU5ER3ND3FDGL3GD2RNU3
R4BR3"
40280 D3$="BU5ER3ND3FDGNL3ND3FDG
L3NHBR8"
40290 D4$="BU3NFU3RD4R2NU4NR2D2B
R5"
40300 D5$="BUFR3NU3EUHL3HU2RND3R
3BD6BR4"
40310 D6$="BUNFU4END6R3FBD3NDHL2
GD2R3NEBR4"
40320 D7$="BU6R5G3D3RNU4BR5"
40330 D8$="BRNR3HUENR3HUEND6R3ND
6FDGFDGBR5"
40340 D9$="BUFR3NU6EU4HL3GDFR3BR
4BD3"
40350 MP$="URDNLBR3"'PERIOD
40360 MS$="BR3"'SMALL SPACE
40370 MM$="URDNLGBUBR3"'COMMA
40380 MA$="BU6URDNLGBD5BR3"'APOS
TROPHE
40390 MN$="BUURDLUBU2URDLBD4BR4"
'COLON
40400 MX$="URDLUBU2U3RD3NLBD3BR3
"'EXCLAM. PT.
40410 GOTO 120
50000 '***INFORMATION***
50010 '*** CHANGE THE <'> ON
LINES 92 AND 95 TO CHOOSE PIGEON
 OR LINES 92 AND 96 TO CHOOSE
SANTA.
50020 '*** LINES 190 AND 191 GET
'SEASONS GREETINGS'.
50030 '***LINE 192 AND 193 GET
'HAPPY EASTER',
50040 'USE WITH LINE 137 AND 138
WHICH IS THE BLANK-OUTS
50050 '***READ THE REM FROM LINE
134 THROUGH 193 FOR COMPLETE
BREAKDOWN!
51000 PMODE 4,1:PCLS:SCREEN1,0
51010 FOR X= 10 TO 245 STEP 10'R
OUTINE FOR CIRCLES
51020 FOR Y=10 TO 180 STEP 10
51030 'LINE(X+5,Y+3)-(X,Y),PSET,
B
51040 CIRCLE(X+2,Y),5,1
51050 NEXT Y,X
51180 FOR X= 132 TO 13 STEP-8'RA
YS FOURTH QUADRANT
51190 FOR Y= 70 TO 10 STEP-8
51200 LINE(132,70)-(X,Y),PSET
51210 NEXT Y,X
51220 FOR X=132 TO 240 STEP 8'RA
YS FIRST QUAD
51230 FOR Y=70 TO 10 STEP-8
51240 LINE(132,70)-(X,Y),PSET
51250 NEXT Y,X
51260 FOR X=132 TO 13 STEP-8'RAY
S THIRD QUAD
51270 FOR Y=70 TO 181 STEP 8
51280 LINE(132,70)-(X,Y),PSET
51290 NEXTY,X
51300 FOR X=132 TO 240 STEP 8'RA
YS SECOND QUAD
51310 FOR Y=70 TO 181 STEP 8
51320 LINE(132,70)-(X,Y),PSET
51330 NEXT Y,X
51335 DRAW"C0BM132,70NU5NL5NR5D8
"
51340 GOTO 90
51350 GOTO 51350
```




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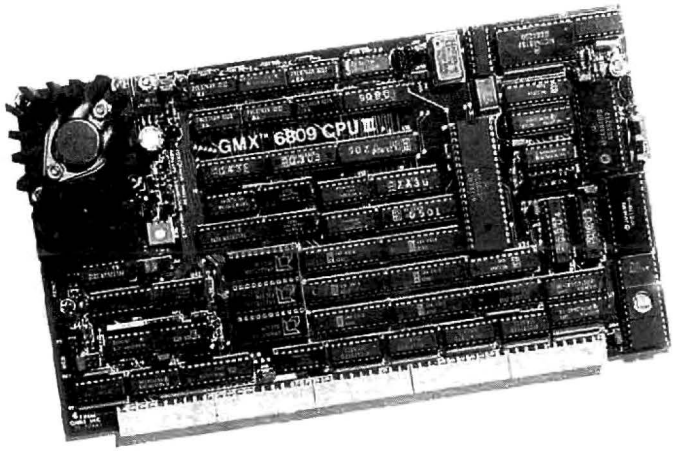
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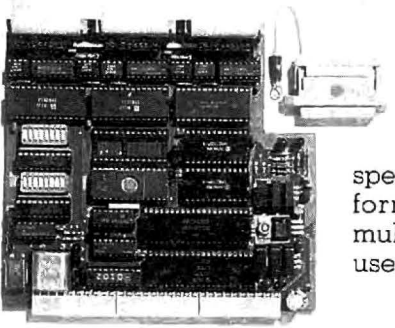
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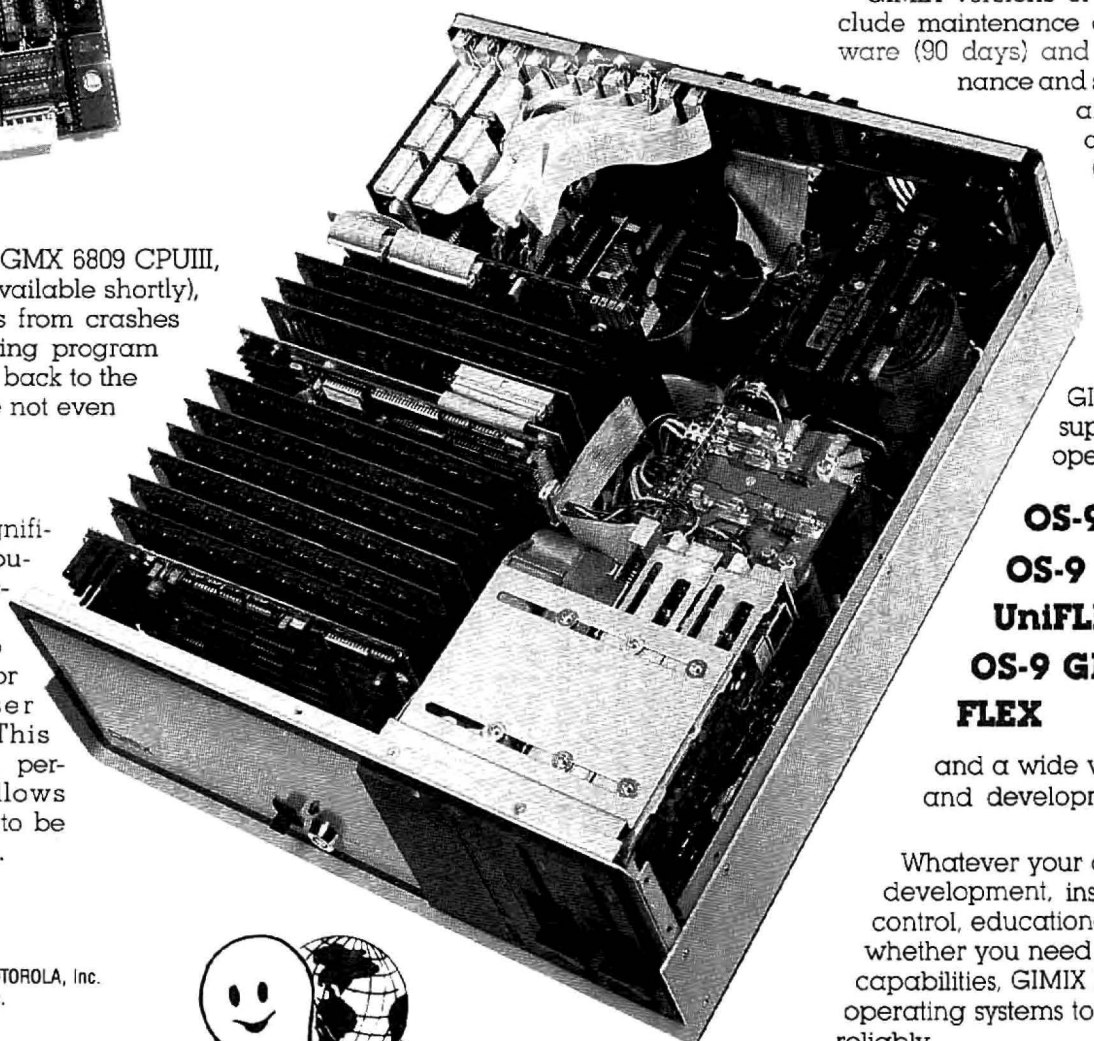
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Understanding Cassette And Disk File Operations

By Richard A. White
Rainbow Contributing Editor

CoCo's cassette and disk file conventions are nearly identical. The only basic differences are the additional options available from Disk BASIC including the ability to have more than one file open and working at a time and the direct access file type that has no cassette counterpart. This discussion will start with cassette file procedure and then slide right into some disk file operations.

Whether cassette or disk, a storage space or buffer is opened, data in character form is fed to the buffer until it is full, or until the file is closed, and then the buffer load is sent to tape or disk. The tape or disk destination is determined by the buffer number. The -1 buffer always is sent to the cassette. Buffers numbered 1 to 15 always go to disk. The buffer number may be carried in a variable so that the program operator may make a decision where data is to be sent. This permits transfer of files from tape to disk and back again.

File buffers must be defined as input or output files. Disk BASIC also supports direct access files which read or write to a single file provided certain rules are followed. Otherwise, an input or an output file is a sequential file. Data is stored in the order it is sent to the file — in sequence. Data is read back into the computer from the file in sequence. Data is returned to the computer in buffer loads just as it was saved from the the computer. File input statements read the data from the buffer until the buffer is empty, at which point the computer stops and gets another buffer full. A cassette buffer is 256 bytes, long in low memory. It is always there and available, even when a disk is in the system. Sequential file disk buffers default to 256 bytes but may be changed in size. Thus far, I have had no reason to use other than default size buffers. However, the disk buffers use memory that could be used by BASIC if the buffer size or number of buffers is redefined. If you are very memory tight, you may wish to explore this option.

You use the *OPEN* command to tell the computer what you want to do.

```
OPEN "0", -1, "FILENAME"
```

This statement tells the computer that the file is to be for output, O, it is a cassette file, -1, and that it is named FILENAME. The computer immediately opens the file by allocating the buffer and by sending a file header to the cassette recorder. The computer assumes that the cassette is connected and set to record with cassette in place. CoCo has no way to know if this is true, so you are well advised to prompt the operator to do these things and wait for the operator to respond before opening the file. After this a *PRINT#-1,* statement will send data to the buffer. CoCo does not care what the data is or what order it is in. If you want it sent, CoCo sends it. BASIC does not care where in the program the *PRINT#-1,* statements are placed as long as a file has been opened.

You pay the price for file disorder when you input the data back to the computer. It returns exactly what was sent out in exactly the order it was sent. Your program must be written to accept data in this order and deal with it. If you code *INPUT#-1, A*, and the next data in the buffer is "HAHA" you have a TM Error and need to do some fixing. Worse, is to send out numeric data in variables X, Y and Z, but to read it back into Z, Y and X. BASIC is happy because these are all numbers, but the numbers are assigned to the wrong variables and program results that use the variables will be wrong without any error message.

The best way to deal with file order is keep your *PRINT#-1,* statements all together in one place. *OPEN* the file, print out all the data and then *CLOSE* it. Then write your *INPUT#-1,* statements following exactly the *PRINT#-1,* sequence. This is not always possible so the next best thing is to put all one-time data to the file from one place in the program and print other data in a standard format from elsewhere in the program. A standard format might be a specific set of variables always printed in the same order. Whatever you do, don't forget file order.

PRINT#-1, can be easily converted to a disk command by changing the buffer number, -1, to a disk buffer number say 1. However, *PRINT#1,* works somewhat differently with a disk than *PRINT#-1,* does with tape. I bring this up now since you may be writing tape based programs that you later may want to convert to disk I/O. In the following discussion, I will attempt to show what data on the disk looks like and talk about what CoCo does when it reads it. Important: a "-" or dash will represent a space on the disk. Let's say a disk file is opened and we print to it.

```
250 PRINT#1,5"DARTS"
```

(Richard White has a long background with microcomputers and specializes in BASIC programming. With Don Dollberg, he is the author of the TIMS data base management program.)

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The data on the disk will look like this:

-5----------DARTS*

The comma established a 16-byte field and put the five with its leading space at the beginning of the field. It filled out the field with 14 spaces and then wrote DARTS. The "*" is an end-of-statement delimiter. Because there is at least one space between "5" and "DARTS", *INPUT#-1* X, X$ will read them in as separate variables. Now let's change the *PRINT#1,* statement.

250 PRINT#1,5,"THROW";"DARTS"

We have sent "THROW" and "DARTS" to the disk as separate words and would like to bring them back in as separate words. They are stored on disk like this:

-5----------THROWDARTS*

Note that there is no delimiter between "THROW" and "DARTS" so the computer cannot separate these words and put them into separate variables as it can from a tape save. PRINT#1,5,"THROW","DARTS prints to disk.

-5----------THROW--------DARTS-----*

INPUT#1,X,X1$,X2$ won't work since *INPUT#1,* accepts spaces as legal characters in a string and does not recognize them as delimiters. In this case everything from the space after the 5 to the asterisk will be put into X1$ and there will be nothing to put into X2$. The solution is to give each separate string or string variable its own separate *PRINT* statement. For a cassette based program write your print statement like this:

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```
250 PRINT#-1,5 : PRINT#-1,"THROW
" : PRINT#-1,"DARTS"
450 INPUT#-1,X,X1$,X2$
```

If you convert to disk, you simply change all -1's to 1's and the program will work like a champ.

Though we used the words "THROW" and "DARTS" above for clarity, you will nearly always be printing a string variable to tape or disk rather than the string itself. There can be any ASCII character in the string and it will be saved. Whether you can read the string back in is another matter. Early in this series I talked about experimenting with BASIC. When you experiment, you will find some weird and maybe wonderful things that are not in the manuals. Don't call them bugs! These discoveries are better seen as how things really work. Now the question on the floor is how much of a string of all ASCII characters, saved to tape or disk can be read back into the computer? The answers will surprise some.

First we must devise a test which is the BASIC Program that follows:

```
5 CLEAR 10000
10 FOR X=32 TO 255 : A$=A$+CHR$(
X) : NEXT : CLS : PRINTA$ : INPU
T Y
20 OPEN"O",#1,"STRTEST" : PRINT#
1,A$ : CLOSE
30 OPEN"I",#1,"STRTEST" : INPUT#
1,A$ : CLOSE : CLS : PRINTA$
40 OPEN"I",#1,"STRTEST" : LINEIN
PUT#1,A$ : CLOSE : PRINTA$
```

Our objective is to make a string containing all ASCII characters, print it to tape twice, and then read it back in using *INPUT#-1,* and *LINEINPUT#-1.* This will show us what we can put to tape and get back. At the same time, there are some other lessons in the program. Line 10 makes our string and prints it to the screen so we can see what we have.

```
!"#$%&'()*+,-./0123456789:;<=>?
@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^
@abcdefghijklmnopqrstuvwxyz
!"#$%&'()*+,-./0123456789:;<=>?
@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^
@abcdefghijklmnopqrstuvwxyz
```

Above is the string as interpreted by *Telewriter* (I appended the ASCII file made by Line 20 to the *Telewriter* file for this article.). If you type in the program and run it, it will first print a blank first line where the control characters are and then start with a space followed by characters ASCII 33 and up. All screen graphics will be in the string. Above, the second series of characters tell us that the graphics character codes were indeed saved (to disk in this case), but *Telewriter* must ignore the set eighth bit and interprets these as characters 1 through 128 again.

Returning to the program, the cassette file to input is opened in line 30 and a string is obtained in line 35 using *INPUT#-1,A$.* If we are not at the end-of-file, EOF(-1), the string is printed to the screen. Here is what we get.

```
!"#$%&'()*+,-./0123456789:;<=>?@
ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^@
abcdefghijklmnopqrstuvwxyz
```

This is a surprise! When getting data from the keyboard, *INPUT* stops at commas, colons, and semicolons. From the

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tape buffer, these characters cause no problems. However, the leading space seems to have been ignored. Also, none of the graphics characters which we think were sent to tape were returned.

At this point, we need to discuss getting two files in sequence off a tape. Line 30 used to look like Line 40. Then the program developed an I/O Error in Line 40. If a program, does not get all data out of an input file on tape, the tape will not run past the end of the file marker. *CLOSE* will not cause the tape to run past this marker. Line 35 is the way to handle any file input. A string or number is obtained using either *INPUT#-1* or *LINEINPUT#-1*. The test for end-of-file is then made: IF EOF(-1) THEN CLOSE -1. This tests file buffer -1, the cassette, and forces the cassette to run to the end of the file on the tape before closing the file. For disk use EOF(1) or EOF(2) etc., depending on which file you are dealing with. When dealing with disk files, always put the file number after *CLOSE*. *CLOSE* alone closes *all* files.

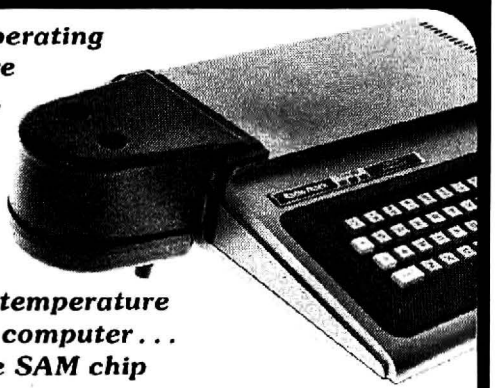
Line 40 gets the string using *LINEINPUT#-1*. The result is that *nothing* is printed. This tells me that one of the control characters at the beginning A$ is stopping *LINEINPUT#-1*. Why was *INPUT#-1* not affected the same way? Well, it was. But, Line 35 is written so that the program keeps going back to the buffer until an end-of-file is found. It might have taken two or more tries to get all the characters. You could find out by running the program with the trace function *TRON*.

```
10 FOR X=32 TO 255 : A$=A$+CHR$(X) : NEXT : CLS
:PRINTA$ : INPUT Y
```

Here, Line 10 is changed to start the string with a space,

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eliminating the control characters. Now, the result using *LINEINPUT#-1* is almost identical to that obtained with *INPUT#-1* except *LINEINPUT#-1* gets the leading space that *INPUT#-1* ignored.

```
 !"#$%&'()*+,-./0123456789:;<=>?
@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^
@abcdefghijklmnopqrstuvwxyz
```

We don't have any other commands for getting characters from the tape buffer. So while we can apparently save graphics characters onto tape, there is no way in BASIC to get them back.

The program to make the same tests from disk is below. Note that I have not bothered to get an EOF(1) in Line 30. Since a disk is random access, it cares not if a file is closed before all data is removed.

```
5 CLEAR 10000
10 FOR X=1TO 255 : A$=A$+CHR$(X)
 : NEXT : CLS : PRINTA$ : INPUT
Y
20 OPEN"O",#1,"STRTEST" : PRINT#
1,A$ : CLOSE
25 SOUND100,20 : AUDIOON : MOTOR
ON : PRINT"REWIND TAPE AND PRESS
  ENTER" : INPUT Y
30 OPEN"I",#1,"STRTEST" : INPUT#
1,A$ : CLOSE : CLS : PRINTA$
35 INPUT#-1,A$ : IF EOF(-1)THEN
CLOSE-1 ELSE : PRINTA$ : GOTO35
40 OPEN"I",#1,"STRTEST" : LINEIN
PUT#1,A$ : CLOSE : PRINTA$
250 PRINT#-1,5 : PRINT#-1,"THROW
" : PRINT#-1,"DARTS"
450 INPUT#-1,X,X1$,X2$
```

The string starts with a space, character 32, to avoid the problem of *INPUT#1* and *LINEINPUT#1* returning nothing the first pass when reading a string with leading control characters. Here is what *INPUT#1, A$* gets:

```
 !"#$%&'()*+
```

The comma stopped the string. We had expected that to happen on input from tape, but it didn't. Now we find where there are differences with tape and disk action for the same command. This is a good reason to stay with *LINEINPUT* for string input from both tape and disk. Using *LINEINPUT#1, A$* we get the following printed to the screen:

```
 !"#$%&'()*+,-./0123456789:;<=>?
@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^
@abcdefghijklmnopqrstuvwxyz
```

No surprises here !

Disk BASIC does have a way to recover all characters sent to the disk. It is *DSKI$* which gets data from a certain sector within a certain track and puts this data into two strings. When you print those strings, all printable characters including graphics characters are printed. This is not as simple as it sounds since you need to know exactly where on the disk the data you want is stored. Further, if the string you are recovering starts in the middle of a sector, it will be divided among one to three strings filled by *DSKI$*. Let's leave that sleeping dog lie, to be disturbed by intrepid programmers with nothing better to do.

At this point, I hope you have a better understanding of the BASIC file commands and their similarities and differen-

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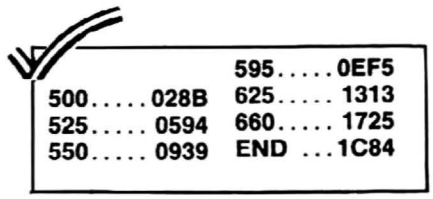
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ces in tape and disk systems. There are a number of disk commands which I have not written about because I have not used them much or at all. There are also the direct disk file commands which are unique to Disk BASIC and which deserve a separate discussion. We will save these for a later article.

Due to an editorial error at *the Rainbow*, the listing that follows was omitted from the November *Bits And Bytes of BASIC* column. It is a BASIC tutorial program on string handling functions.



The listing:

```
5 'STRING HANDLING TUTORIAL
6 'RICHARD WHITE, 44 DOW CT.  FA
IRFIELD, OH   45014  513-829-851
0
10 CLS:NO$="things to note;":S4$
="                              "
14 GOTO500
18 PRINT@480,"press any key to c
ontinue";:FORJ=-1TO0:J=(J$=INKEY
$):NEXT:RETURN
20 FORX=1TO600:NEXT:RETURN
50 PRINT:PRINT"OIUNRJMV09TUB    "
G          'THIS IS A ' IS NOT
ASSIGNED TO"
540 PRINT"A VARIABLE. IT IS STIL
L A STRINGBUT IS USED ONLY IN TH
E PRINT   STATEMENT IN LINE 20."
,"WHEN YOU RUN THE PROGRAM YOU G
ET":PRINT:PRINT"THIS IS A DEMONS
TRATION":GOSUB18
545 CLS:PRINT@64,"2000 S1$="CHR$
(34)"MESSAGE ONE"CHR$(34)":S2$="
CHR$(34)"MESSAGE TWO"CHR$(34)":S
3$="CHR$(34)"MESSAGE THREE"CHR$(
34)":RETURN":PRINT:PRINT"STRINGS
 THAT ARE DEFINED IN THE PROGRAM
 ARE BEST PLACED AT THE"
550 PRINT"END OF THE PROGRAM AND
 READ BY AGOSUB AT THE BEGINNING
 OF  THE  PROGRAM.  THIS MAKES B
ASIC PASS OVER THE LINE ONLY ONC
E AND     SPEEDS PROGRAM OPERATI
ON.":GOSUB18
555 CLS:PRINT@64,"10 INPUT A$":P
RINT:PRINT"THIS IS THE BASIC STA
TEMENT TO  ENTER A STRING FROM T
HE         KEYBOARD. IT WILL ACC
EPT ANY    CHARACTER except  ,
;  AND "CHR$(34)".","<ENTER> TER
MINATES THE STRING"
560 PRINT"ENTRY AND STORES THE C
:GOSUB20:FORX=1TO31:PRINTCHR$(15
0+X);:NEXT:GOSUB20:PRINT:PRINT"6
453.986":GOSUB20:PRINT"^!#&%$'&)
(*=?><+.,":GOSUB20:S$="DEMONSTRA
TION":PRINTS$:GOSUB20:PRINT:RETU
RN
52 PRINT"10 S$="CHR$(34)"DEMONST
RATION"CHR$(34),"20 PRINT"CHR$(3
4)"THIS IS A "CHR$(34)"S$":RETUR
N
500 CLS:PRINT@37,"string tutoria
l program":PRINT@96,"WHAT IS A S
TRING?":GOSUB20:PRINT:PRINT"A st
ring IS ANY SERIES OF      char
acters- ANY characters WILL DO.
HERE ARE SOME EXAMPLES:":GOSUB20
:GOSUB20:GOSUB50
505 GOSUB18:CLS:PRINT,,,,:GOSUB5
0:PRINT:PRINTNO$:PRINT"ANY chara
cter- EVEN GRAPHICS    AND NON-P
RINTING CONTROL        CHARACTER
S CAN BE PUT INTO A    STRING.":
GOSUB18
510 CLS:PRINT@64,"A BACKSPACE IS
 A control         character. WHE
N YOU PRESS A KEY TO CONTINUE, T
HE COMPUTER WILL  PRINT THE STRI
NG 'DEMONSTRATION'WAIT A FEW SEC
ONDS AND PRINT A  STRING CONTAIN
ING 9 backspaces.":GOSUB18:PRINT
@292,S$;:GOSUB20
515 FORX=1TO9:BS$=BS$+CHR$(8):NE
XT:GOSUB20:PRINTBS$:GOSUB18
520 CLS:PRINT@32,"THERE ARE A NU
MBER OF WAYS TO   PUT A STRING I
NTO A COMPUTER.":PRINT:PRINT"   (
1) MAKE IT PART OF A PROGRAM.   (
2) USE INPUTS$  (COLOR BASIC)   (
3) USE LINEINPUT (EXT. BASIC)   (
4) USE INKEY$ (GET ONE
   CHARACTER AT A TIME)"
525 PRINT:PRINT"LETS START WITH
PUTTING A STRINGINTO A PROGRAM."
:GOSUB18:CLS:PRINT@32,"HERE IS A
 PROGRAM THAT KEEPS    STRINGS T
WO WAYS.",,,:GOSUB52:GOSUB18
530 CLS:PRINT@32,;:GOSUB52:PRINT
:PRINT:PRINT"IN LINE 10, THE STR
ING IS        assigned TO S$. THE
 STRING IS    NOW AVAILABLE ANYWH
ERE IN THE    PROGRAM BY USING IT
S string      variable 'S$'.",,"S
$ does not equal DEMONSTRATION."
;
535 PRINT"RATHER S$ represents T
HE STRING AND MAKES IT POSSIBLE
FOR THE    COMPUTER TO FIND THE S
TRING      assigned TO IT.":GOSUB
18:CLS:PRINT@32,;:GOSUB52:PRINT:
PRINT:PRINT"IN LINE 20 THE STRIN
HARACTERS TYPED IN THE STRING VA
RIABLE     A$.":GOSUB18
565 CLS:PRINT@64,"10 LINEINPUT A
```

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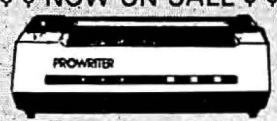
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```
$":PRINT:PRINT"THIS IS AN EXTEND
ED BASIC        STATEMENT TO  ENT
ER A STRING     FROM THE KEYBOARD
. IT WILL       ACCEPT ANY CHARAC
TER THAT CAN    BE TYPED.",,"<ENT
ER> TERMINATES THE"
570 PRINT"STRING ENTRY AND STORE
S THE      CHARACTERS TYPED IN TH
E STRING  VARIABLE A$.":GOSUB18
575 CLS:PRINT@64,"20 I$=INKEY$:I
F I$="CHR$(34)CHR$(34)" THEN20 E
LSE RETURN":PRINT:PRINT"ABOVE IS
 THE SUBROUTING TO GET  ONE CHAR
ACTER ONLY FROM THE KEY-BOARD AN
D RETURN IT IN I$ TO THEBASIC PR
OGRAM. THE CHARACTER IS not prin
ted  AS CHARACTERS ARE"
580 PRINT"WHEN INPUT AND LINEINP
UT ARE     USED. THE PROGRAM KEEP
S GOING    BACK TO LINE 20 UNTIL
A KEY IS   PRESSED.":GOSUB18
585 CLS:PRINT@64,"20 I$=INKEY$:I
F I$="CHR$(34)CHR$(34)" THEN20 E
LSE RETURN":PRINT:PRINT"USE THE
INKEY$ ROUTINE WHEN YOU ONLY WAN
T ONE CHARACTER FROM THEKEYBOARD
 TO USE IN DETERMINING  WHAT THE
 PROGRAM IS TO DO NEXT."
590 PRINT"IT SAVES THE USER FROM
 ALWAYS     HAVING TO PRESS <ENTE
R>.":PRINT:PRINT"590 GOSUB20: IF
 I$="CHR$(34)"Y"CHR$(34)" THEN 6
50 ELSE IF I$="CHR$(34)"N"CHR$(3
4)" THEN 700 ELSE 590";:GOSUB18
595 CLS:PRINT@64,"20 I$=INKEY$:I
F I$="CHR$(34)CHR$(34)" THEN20 E
LSE I=VAL(I$):RETURN":PRINT:PRIN
T"IF A NUMBER IS NEEDED, INKEY$
  CAN STILL BE USED WITH THE
  ADDITION OF  I=VAL(I$)  BEFORE
  THE RETURN.";
600 PRINT" THIS IS MOST USEFUL W
HEN USED WITH A MULTIPLE CHOICEM
ENU AND  ON I GOSUB  OR        O
N I GOTO.":PRINT:PRINT"120 GOSUB
20:ON I GOSUB 200,300, 400,500":
GOSUB18
605 CLS:PRINT@64,"120 GOSUB20:ON
 I GOSUB 200,300, 400,500":PRINT
:PRINT"HERE IS HOW  ON I GOSUB W
ORKS.  IF I=1 THEN THE PROGRAM G
OES TO LINE 200, IF I=2 IT GOES
TO 300 ETC. IF I IS NOT 1-4, THE
       PROGRAM GOES TO THE NEXT
BASIC  LINE.":GOSUB18
610 CLS:PRINT@64,"200 A$=B$+C$+D
$":PRINT:PRINT"STRINGS MAY BE AD
DED TO EACH    OTHER. THIS IS CA
LLED           CONCATENATION.":P
RINT:GOSUB20:GOSUB20:B$="STRING
":D$="DEMO.":C$="CONCATENATION "
:PRINT"B$="CHR$(34)B$CHR$(34),"D
$="CHR$(34)D$CHR$(34)
615 PRINT"C$="CHR$(34)C$CHR$(34)
:GOSUB18:PRINT@352,"A$=B$+D$
 THEN","A$="CHR$(34)B$D$CHR$(34)
:GOSUB18:PRINT@352,S4$;S4$:PRINT
@352,"A$=C$+D$      THEN","A$="CH
R$(34)C$D$CHR$(34):GOSUB18
620 PRINT@352,S4$;S4$:PRINT@352,
"A$=D$+C$      THEN","A$="CHR$(3
4)D$C$CHR$(34):GOSUB18:PRINT@352
,S4$;S4$:PRINT@352,"A$=B$+C$+D$
   THEN","A$="CHR$(34)B$C$D$CHR$
(34):GOSUB18
625 CLS:PRINT"HOW LONG IS THAT S
TRING, COCO?":PRINT:PRINT"B$="CH
R$(34)B$CHR$(34),"D$="CHR$(34)D$
CHR$(34):PRINT"C$="CHR$(34)C$CHR
$(34):PRINT:PRINT"LENGTH=LEN(YOU
RSTRING$)":GOSUB18:PRINT@224,"B=
LEN(B$)","B="LEN(B$):PRINT
630 PRINT"C=LEN(C$)","C="LEN(C$)
:PRINT:PRINT"D=LEN(D$)","D="LEN(
D$):GOSUB18
635 CLS:PRINT"WHAT COCO PUTS TOG
ETHER-","    COCO CAN TAKE APART
.":PRINT:PRINT"B$=LEFT$(A$,L)",,
"B$=MID$(A$,X,L)",,"B$=RIGHT$(A$
,L)":PRINT:PRINT"THESE FUNCTIONS
```


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```
 EXTRACT A PART  OF ONE STRING F
ROM ANOTHER AND  ASSIGN THAT PAR
T TO A STRING"
640 PRINT"VARIABLE.":A$="STRING
FUNCTIONS DEMO":GOSUB18:CLS:PRIN
T@64,"B$=LEFT$(A$,5)":PRINT:PRIN
T"THIS TELLS COCO TO GET THE LEF
T FIVE (5) CHARACTERS THAT ARE I
N STRING A$ AND PUT THEM IN STRI
NGB$.":PRINT:PRINT"  A$="CHR$(34
)A$CHR$(34):GOSUB18
645 PRINT@386,"B$="CHR$(34);:PRI
NT@326,"!!!!!":GOSUB20:PRINT@358
,"!!!!!":GOSUB20:PRINT@390,"STRI
N"CHR$(34):GOSUB18
650 CLS:PRINT@64,"B$=MID$(A$,8,9
)":PRINT:PRINT"THIS TELLS COCO T
O GET THE NINE (9) CHARACTERS ST
ARTING AT       POSITION EIGHT (8
) IN STRING A$ AND PUT THEM IN S
TRING B$.":PRINT:PRINT"  A$="CHR
$(34)A$CHR$(34):GOSUB18
655 PRINT@386,"B$="CHR$(34);:PRI
NT@333,;:FORX=1TO9:PRINTCHR$(95)
;:NEXT:GOSUB20:PRINT@361,;:FORX=
1TO9:PRINTCHR$(95);:NEXT:GOSUB20
:PRINT@390,"FUNCTIONS"CHR$(34):G
OSUB18
660 CLS:PRINT@64,"B$=RIGHT$(A$,4
)":PRINT:PRINT"THIS TELLS COCO T
O GET FOUR (4) CHARACTERS STARTI
NG AT THE RIGHTEND OF STRING A$
AND PUT THEM INSTRING B$.":PRINT
:PRINT"  A$="CHR$(34)A$CHR$(34):
GOSUB18
665 PRINT@386,"B$="CHR$(34);:PRI
NT@343,;:FORX=1TO4:PRINTCHR$(95)
;:NEXT:GOSUB20:PRINT@366,;:FORX=
1TO4:PRINTCHR$(95);:NEXT:GOSUB20
:PRINT@390,"DEMO"CHR$(34):GOSUB1
8
670 CLS:PRINT"COCO CAN CONVERT A
 NUMBER TO A  STRING.":PRINT:PRI
NT"B$=STR$(X)":PRINT:PRINT"WHY Y
OU ASK?  EXTENDED BASIC    PLAY
AND SOME GRAPHICS COMMANDS NEED
NUMBERS TO BE IN STRINGS.  ALSO
PUT NUMBERS INTO STRINGS   BEFOR
E COMPARING AND AVOID"
675 PRINT"ERRORS DUE TO FLOATING
 POINT    NUMBER STORAGE. Type a
ny number or  0  to continue."
680 PRINT@448,"";:INPUT X:IFX<>0
 THEN B$=STR$(X):PRINT"B$="B$;:G
OSUB20:GOSUB20:GOSUB20:PRINT@448
,"":PRINTS4$;:GOTO680
685 CLS:PRINT"PROBLEM-",,"WRITE
A BASIC LINE THAT PRINTS  THIS T
EXT complete WITH QUOTES.",,,"A$
="CHR$(34)"DEMONSTRATING CHR$()"
CHR$(34):PRINT:PRINT"THIS LINE D
OESN'T WORK-":PRINT
690 A$="100 PRINT"+CHR$(34)+"A$=
"+CHR$(34)+"DEMONSTRATING CHR$()
"+CHR$(34)+CHR$(34):PRINTA$:PRIN
T"CAN YOU FIGURE OUT WHY?":GOSUB
18:CLS:PRINTA$:PRINT
695 PRINT"THE "CHR$(34)" SYMBOL
TELLS THE COMPUTER WHEN  TO STAR
T AND STOP A        STRING. YOU C
ANNOT PUT ONE IN A STRING AND  H
OPE IT WILL BE      PRINTED. IT S
TOPS THE STRING     INSTEAD. BUT,
 THIS TUTORIAL"
700 PRINT"PROGRAM PRINTS "CHR$(3
4)"'S.   WHY?":GOSUB18:CLS:PRINT
A$:PRINT:PRINT"THIS PROGRAM USES
  "CHR$(34)"CHR$(34)"CHR$(34)" T
ODO THE JOB. CHR$(34) TELLS THE
 COMPUTER TO PRINT THE CHARACTER
 WHOSE ASCII VALUE IS 34. THAT"
705 PRINT"CHARACTER IS A "CHR$(3
4)".":PRINT"STUDY LINES 685 TO 6
90 OF THIS  TUTORIAL TO SEE HOW
IT IS DONE. THAT'S IT FOR NOW- I
 HOPE YOU   HAVE LEARNED SOMETHI
NG":GOSUB18:LIST685-690
890 END
2000 SAVE"STRINGTU",A
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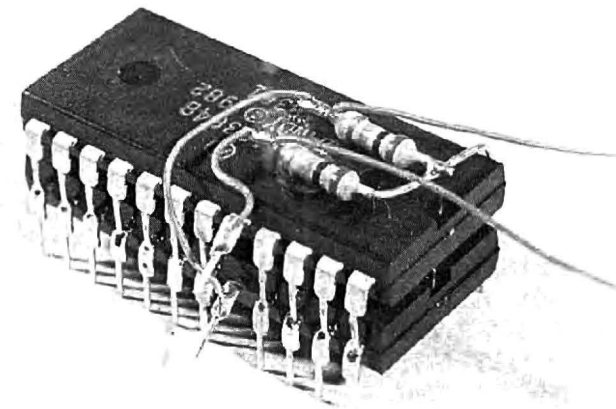
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Install Your Own ROM 'Switcher'



By Tony DiStefano
Rainbow Contributing Editor

If you feel two ROMs are better than one, try this month's hardware mod project.

Ready 1.0, 1.1, 1.2, 7.5, 9.4 hike! No, this is not a football lesson. It's a problem that Radio Shack has presented Color Computer users. There are presently three versions of the BASIC ROM. These are 1.0, the very first version to come out; 1.1, the second one to come out and probably the most common; and the latest one, 1.2. There are many differences between them, (I am not about to describe all of their differences in this article), but when a friend of mine bought the latest version of the Color Computer, he was very happy to find out that a lot of the basic software ran a little faster on the 1.2 version. Of course, I wanted the newer version, too. But I also wanted to be compatible with the older software. I wanted the best of the two worlds. So I got out my old soldering iron and proceeded to do just that. I'll show you how to modify your computer to have and be able to select between two of them.

The first thing you'll need to know is what version you have in your computer. The way to do that is simple. You just have to type in: EXEC 41174 [ENTER]. This will tell you what version you have. If you don't have the 1.2 version then read on! You, too, may want to be able to select between the two. If you have the 1.2 version already, you may want to have the 1.1 version also. If you have 1.0, you may want to have 1.1 also, or 1.2 — in fact you may have any two of the ROMs.

The next thing you have to do is to acquire the newer 1.2 BASIC ROM (or whichever one you want to add). I went to my local Radio Shack Computer Center and tried to order one. They said that it would take weeks to arrive. I am much too impatient to wait that long, so I called up my old friend Bob Rosen from Spectrum Projects. He had some in stock and sent me one right away.

Now it's time to get down to the nitty-gritty of this month's project. All you will need for this project is the 1.2 ROM (or any other), two 10K ohm resistors and a single pole double throw switch. A good switch to use is a RS #275-625. Any SPDT switch will work, but I like this one because it is very small and will fit almost anywhere. Open your computer in the usual way. Remove the BASIC ROM with an IC remover. If you don't have an IC remover, a small flat screwdriver will work. Stick the blade under one side of the IC. Push in very slowly. The IC should start to lift. Don't push too hard or too far in. Push in just enough so that the IC begins to lift. Now remove the screwdriver and insert it in the other end. Again push in until it starts to lift. Keep doing this procedure back and forth until the IC comes out.

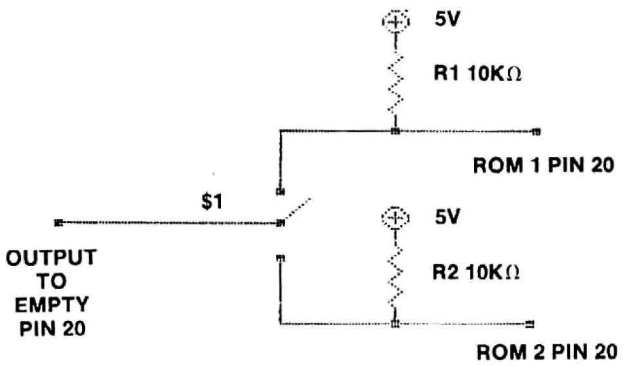
Next, mount the new IC on top of the old one. Make sure that pin 1 on the old pin matches pin 1 on the new one. It's time to solder them together, but leave a space in between the two chips, so that the air can circulate between the chips and keep them cool. You don't want a heat problem to

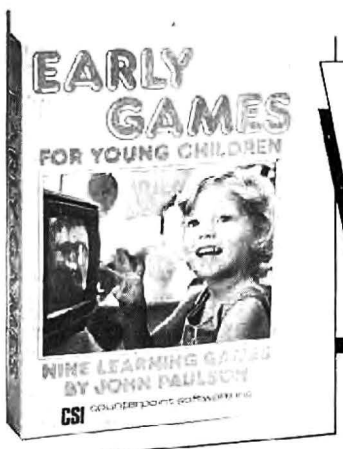
(Tony DiStefano is well known as an early specialist in Color Computer hardware projects. He is one of the acknowledged experts on the "insides" of CoCo.)

develop. I used a popsicle stick as a spacer. Solder all the pins except pin 20. Leave pin 20 of the two ROMs unsoldered. In fact, pull them apart a little just to be sure that you don't. Next, cut the two 10K ohm resistors so as to make them fit. Examine Photo 1 to get the proper positioning of the two resistors. Solder them together according to the photo. Solder the resistors to pin 1 of the IC pack (or better known as piggy-back — remember 32K). Next, take two small pieces of light gauge wire (wirewrap wire 278-501 from RS is a good wire to use) and wire the resistors and the protruding pins together using Figure 1 as schematic. Remember to clean any residue left from soldering. Solder the other ends of thes wires to each side of switch 1. The center pin of the switch goes to the empty pin 20 on the socket, the pin that we lifted earlier. The best way to do that is to take a $^{3}/_{16}$" piece of stiff wire (a snipped off piece of resistor lead will do just great) and solder it to the end of the wire. The end of this wire will go into the empty pin of the socket.

Find a good spot to mount the switch. You will need a $^{3}/_{16}$" drill bit and drill if you used the RS one. I mounted mine on the back cover just left of the reset button. Okay, now insert the IC pack into the socket. Make sure that pin 20 on the bottom IC does not enter the socket. It must be bent enough so that it rests on the outside of the socket and another wire can be inserted into the hole. Insert the wire that comes from the center pin of the switch into the hole. Check your work carefully. When you think all is right, turn on the computer. Make a note which side the switch is on and type in EXEC 41175. This will tell you which ROM is active. Turn the computer off, flip the switch and turn it on again. Type in EXEC 41175 again. Now you should have the other ROM active. Note the setting on the switch and mark it above the switch. Flipping the switch when the computer is on will not harm the computer but it is not recommended because the BASIC interpreter might get lost. That is to say, the software expects certain routines to be in certain places. If you switch the routines around (by switching the ROMs) without telling BASIC about it, BASIC will jump to the wrong place and get lost. Close up the computer and tidy up your room. I'll see you next month.

Figure 1





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FAST, FUN AND EDUCATIONAL — THAT'S SPEEDMATH

By Thomas Gray

Brightly colored clowns, fireworks, and smile faces appeal to educational programmers as rewards or motivators. How many smile faces and fireworks displays do you see in the average video arcade? Darned few! Yet there is no doubt that most arcade games are highly motivating: it is one quality of a good arcade game that you *want* to plug in one more quarter to get just another thousand points.

That higher score is both an achievement and a reward. Once the basics of a game or subject are mastered, increasing competence is itself a strong motivator. Thus, the student who can handle basic math facts with some degree of speed and accuracy will be motivated by the challenge of *increased* speed and accuracy. As a teacher, I've experienced this.

Speedmath presents a series of basic math facts* at lightning pace. As quickly as the user can hit the keys, the next question appears. To add to the challenge, a colored bar shrinks and a countdown timer ticks inexorably down to zero. When the questions are finished, the student gets a rating of his performance, a score and a list of missed problems.

The program can be as addictive as an arcade game. "Please, Mr. Gray," one of my students will plead, "just one more game! I'm up to 'QUIZ WHIZ' and I only missed 'SUPER WHIZ' by three seconds!" I've had to shut off the computer to get some students to quit!

Program Outline

100—200

The program nominally starts here, with a simple cover that prints the color bar and requests input of the user's name. The name is poked into memory locations 1000 to 1009 for no other reason than that I was playing with ways to retain some strings while clearing others. That location turned out to be a handy place to store information without crashing the program.

200—300

This short section generates the complete set of 100 number pairs needed for a basic facts test. The pairs (00,01,02 . . . 10,11,12 . . . 98,99) are stored as strings.

300—400

The menu allows the user to select a single operation —adding, subtracting, multiplying, dividing — or a mixture of the four, and to set the number of problems. Since division by zero is unworkable, the program restricts the number of questions to 88 for this option and for the mixed problems. You can change the minimum number of problems by altering lines 335 and 345.

400—500

Here the user selects a difficulty level. This basically sets the average time available to do each problem. Level 6 (Beginner) gives six seconds per problem, while level 1 (Super Whiz) allows only one second per problem. On subsequent games, the level is determined by previous performance, and this menu is bypassed. The level, like the name

(Tom Gray, BSc., BEd., has received two awards for innovative science teaching. His interests include computers, electronics, and "things that fly.")

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and the time (and for the same reason), is poked into a low memory location, in this case address 256.

500—590

The display menu allows the user to choose any, all or none of the display options: color bar, countdown timer (called stopwatch in the program) and a periodic "tick." Some students are spurred on by these displays, while others may find that the display raises their anxiety too much, or is too distracting.

600—690

Arrays are set up to hold the questions, correct answers, and incorrect student responses. String functions are used to convert the number pairs (Lines 200—290) into appropriate math problems. The specified number of pairs is selected at random from the bank of 100 (or 88 if division is involved; division by zero is checked at Line 665). Subtraction is defined as the sum of addends less one of the addends (in Line 655) to avoid negative differences; division is similarly treated (Line 665) to ensure whole number quotients. Since I dislike having a computer just sit — I always wonder if it's hung up — Lines 670—680 make random sounds and print soothing assurances that progress is being made.

700—790

Line 710 sets some variables; the timer is not reset until the last possible moment, at Line 725. Probably the simplest way to alter the ratings might be to change variable <D> in line 710. For example, D=2*NQ*(K-0.5) would allow the user more time to respond. The answer retrieval in Lines 740—755 involves *INKEY$* rather than *INPUT*. This is much faster, involving one less keypress per answer ([ENTER] is not needed). *INKEY$* also allowed easier access to the decrement subroutine. The *INKEY$* strings are compared to the correct answer in Line 760 and the appropriate scores incremented.[1]

800—890

A kind of report card gives the number right, examines errors and time to revise the rating (Line 845—960), and lists the problems needing further work. If I had a printer, I'd want a hard copy of this.

Subroutines

15

This subroutine handles the time displays. Because it is accessed so often, it is right up front. (I've read that this increases execution speed. On this program it didn't seem to make much difference.)

1000

Draws the color bar for the cover and timing displays.

2000

A friendly pause to continue when the user is ready.

3000

Someday there'll be bells and whistles — put in your favorite sounds and melodies.

4000

Instructions.

Variables

T	—	timer value to shorten color bar
SW	—	stopwatch flag
CB	—	color bar flag
P	—	screen location for color bar
SD	—	sound flag
X	—	screen location for cover graphics; counter location elsewhere
W	—	delay counter
N$	—	user name
M	—	memory location for N$; marker for random problems
P$	—	number pair array
S$	—	sign array
N	—	counter in fact pair generation
Y	—	ditto
S	—	sign (operation) of problem
NQ	—	number of questions
R$	—	rating
K	—	difficulty level
L$	—	left number in problem
L	—	value of L$
R$	—	right number in problem
R	—	value of R$
NW$	—	array for incorrect responses
CA	—	array for correct answers
Q$	—	array for questions
Q	—	question counter
A$	—	student answer keypress
B$	—	ditto
A	—	numerical value of student response
NW	—	counter for incorrect responses

**A basic fact is a pair of single digit numbers on which a mathematical operation (such as adding, subtracting, etc.) can be performed without regrouping (commonly called "carrying" in addition or multiplication, "borrowing" in subtraction, and "bringing down" in division).*

[1] *As noted in the instructions, **INKEY$** does not allow the player to correct an answer. In a speed test, a correction costs in elapsed time, so **Speedmath** urges the player to press on.*

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MIN	—	number of whole minutes in SEC
SEC	—	number of seconds elapsed
LEFTOVER	—	seconds left after min is subtracted from sec
LEV	—	rating based on performance (replaces K)
G$	—	repeat game input



```
 50....016C   615....0C89
150....032B   715....0F53
235....0531   835....11A4
345....0793   900....1430
435....09E8  4000...169E
             END...1936
```

The listing:

```
1 ' ***** SPEED MATH ******
2 'BY T. GRAY
3 'BOX 39, SUNNYBROOK, ALBERTA
4 'CANADA TOC 2MO
5 '
10 PMODE0:PCLEAR1:GOTO 100
15 '***SUBROUTINE TO DECREMENT C
OLOR BAR AND/OR TIMER DISPLAY***
20 T=INT(TIMER/D)
25 IF PEEK(255)=T THEN RETURN
30 IF T<256 THEN POKE 255,T
35 IF TIMER>30000THENPLAY"T1;L1;
12":END
40 IF SW=1THENPRINT@11,D/2 - INT
(TIMER/60);
45 IFCB=1ANDP>=1408 THEN POKE P,
96:P=P-1
50 IFP<1408 THEN RETURN
55 IF SD=1 THENPLAY"T50;10"
60 RETURN
65 '
100 '***COVER DISPLAY***
105 CLS:PRINT@169,"SPEED MATH"
110 FOR X=1024 TO 1055:POKEX,166
:POKEX+480,166:NEXT
115 FOR X=1024 TO 1504 STEP32:PO
KEX,166:POKE X+31,166:NEXT
120 POKE256,0:CB=1: GOSUB1000
125 FORP=1438 TO 1409STEP-1
130 POKEP,96:FORW=1TO50:NEXTW:PL
AY "T50;V20;10":PRINT@233,RND(9)
;" + ";RND(9);
135 NEXT P
140 PRINT@233,"BY T. GRAY";
145 FORW=1TO150:NEXTW:FORT=1TO5:
SOUND10,2:NEXT
150 PRINT@233,"                ";:PRIN
T@292,"PLEASE TYPE YOUR NAME";:P
RINT@324,"AND PRESS <ENTER>";:PR
INT@356,"";:INPUT N$:N$=N$+","
155 IF LEN(N$)>10 THEN PRINT@356
,STRING$(15," "):PRINT"TOO LONG.
 GIVE ME A SHORTER NAME":GOTO150
160 CLS:GR$="HELLO, "+N$:PRINT@1
44-(LEN(GR$)/2),GR$:PRINT:PRINT:
```

```
PRINT"     WELCOME TO SPEED MATH
.":PRINT:PRINT"  DO YOU WANT INS
TRUCTIONS?":PRINT"  TYPE <Y> OR
<N> AND <ENTER>":INPUT A$:IFLEFT
$(A$,1)="Y"THENGOSUB4000
165 CLS:PRINT"ONE MOMENT, PLEASE
....":M=1000:FOR X=1TO LEN(N$):P
OKE M,ASC(MID$(N$,X,1)):M=M+1:NE
XTX:FORX=M TO 1009:POKEX,32:NEXT
X
170 PLAY"T5;L2;C;E;G;L2;C"
180 '
200 '***GENERATE FACT PAIRS***
205 CLEAR1000
210 DIMP$(100),S$(4)
215 N=1:FORX=0TO9:FORY=0TO9
220 P$(N)=STR$(X)+STR$(Y)
225 N=N+1
230 NEXTY,X
235 GOSUB 2000
240 FORX=1000 TO 1009:N$=N$+CHR$
(PEEK(X)):NEXTX
250 '
300 '***SELECT # AND KIND OF QUE
STIONS***
305 CLS:PRINT@42,"SPEED MATH"
310 PRINT@100,"WHAT KIND OF PROB
LEMS?":PRINT
315 PRINTTAB(10)"1. ADDITION":PR
INTTAB(10)"2. SUBTRACTION":PRINT
TAB(10)"3. MULTIPLICATION":PRINT
TAB(10)"4. DIVISION":PRINTTAB(10
)"5. MIXED"
320 PRINT@353,"TYPE THE NUMBER O
F YOUR CHOICE  AND PRESS <ENTER>
"
325 INPUT S
330 IF S<1 OR S>5 OR S<>INT(S)TH
ENPRINT@321,"ENTER A NUMBER FROM
 1 TO 5 ONLY":GOTO325
335 CLS:PRINT@100,"HOW MANY QUES
TIONS?":PRINT@162,"TYPE A NUMBER
 FROM 10 TO 100    AND PRESS <EN
TER>.";
340 INPUT NQ
345 IF NQ<10 OR NQ>100 OR NQ<>IN
T(NQ) THEN PRINT@100,STRING$(32,
" "):PRINT@164,"PLEASE ENTER A N
UMBER":PRINT" FROM 10 TO 100.";:
GOTO340
350 IF S=4 AND NQ>88 OR S=5 AND
NQ>88THENPRINT@96,STRING$(5," ")
:PRINT@160,"SORRY, THERE ARE ONL
Y 88         DIFFERENT DIVISION F
ACTS, SO     THE MOST YOU CAN DO
IS 88!!      PLEASE ENTER A SMALL
ER NUMBER!":GOTO340
360 '
400 '***SET TIME***
405 DATA SUPER WHIZ,QUIZ WHIZ,PL
AIN WHIZ,GEE WHIZ,SLOW WHIZ,BEGI
NNER
410 FOR X=1TO6:READ R$(X):NEXT
415 CLS:IF PEEK(256)=0THEN PRINT
:PRINT"CHOOSE YOUR DIFFICULTY LE
VEL:":PRINT:FORX=1TO6:PRINTTAB(5
)X" ";R$(X):NEXT X:GOTO 420 ELSE
440
420 PRINT:PRINT"caution: AT THE
HIGHEST LEVEL   YOU WILL HAVE ON
LY 1 SECOND TO  DO EACH PROBLEM!
!!!"
425 INPUT K
430 IF K<1 OR K>6 OR K<>INT(K)TH
ENPRINT@224,STRING$(96," "):PRIN
T"ENTER A NUMBER FROM 1 TO 6 ONL
Y":GOTO 425
435 GOTO 505
440 PRINT@128,N$:PRINT:PRINT"YOU
 ARE NOW RATED AS":PRINT TAB(5)P
EEK(256)TAB(10)R$(PEEK(256))
445 K=PEEK(256):GOSUB2000
450 '
500 '***SELECT DISPLAY***
505 CLS:PRINT@64,"CHOOSE THE TIM
E DISPLAY YOU WANT":PRINT"(TYPE
Y FOR YES, N FOR NO AND   <ENTER
>)"
510 PRINT@229,"1. COLOR BAR ":PR
```


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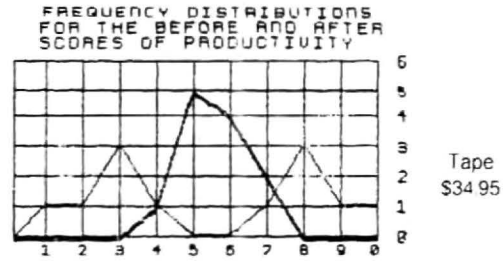
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```
INT@293,"2. STOPWATCH ":PRINT@35
7,"3. SOUND"
515 PRINT@244,"";:INPUT"Y/N";CB$
:PRINT@244,LEFT$(CB$,1);"  ":IFL
EFT$(CB$,1)="Y"THENCB=1 ELSE CB=
0
520 PRINT@308,"";:INPUT"Y/N";SW$
:PRINT@308,LEFT$(SW$,1):IF LEFT$
(SW$,1)="Y"THENSW=1 ELSE SW=0
525 PRINT@372,"";:INPUT"Y/N";SD$
:PRINT@372,LEFT$(SD$,1):IF LEFT$
(SD$,1)="Y" THEN SD=1 ELSE SD=0
530 GOSUB2000
535 CLS:PRINT@128,"ONE MOMENT, P
LEASE...."
540 '
600 '***DEFINE SIGNS, MAKE QUEST
IONS***
605 DATA " + "," - "," X "," / "
610 FORX=1TO4:READS$(X):NEXTX
615 '***SELECT NQ FACT PAIRS***
620 IF S<>5 THEN M=S
625 DIM NW$(NQ),CA(NQ),Q$(NQ)
630 FORQ=1TONQ
635 N=RND(100):IFP$(N)=""THEN635
640 L$=LEFT$(P$(N),2):R$=RIGHT$(
P$(N),1):L=VAL(L$):R=VAL(R$)
645 IF S=5 THEN M=RND(4):ONR GOT
O 650,655,660,665
650 IF M=1 THEN Q$(Q)=L$+S$(M)+R
$:CA(Q)=L+R:GOTO670
655 IF M=2 THEN Q$(Q)=STR$(VAL(L
$)+VAL(R$))+S$(M)+R$:CA(Q)=L:GOT
O670
660 IF M=3 THEN Q$(Q)=L$+S$(M)+R
$:CA(Q)=L*R:GOTO670
665 IF M=4 AND VAL(R$)<>0 THEN Q
$(Q)=STR$(VAL(R$)*VAL(L$))+S$(M)
+R$:CA(Q)=L:GOTO670 ELSE P$(N)="
":GOTO635
670 IF Q=INT(NQ/3)THENPRINT:PRIN
T:PRINT"   JUST RELAX...."
675 IF Q=INT(2*NQ/3)THENPRINT:PR
INT:PRINT"      ALMOST DONE NOW.
..."
680 R=0:P$(N)="":SOUND RND(255),
1:NEXT Q
685 '
700 '******DISPLAY QUESTION,CHEC
K ANSWER, TIME RESPONSE********
705 CLS
710 NW=0:POKE255,0:P=1471:D=2*NQ
*K
715 IF SW=1THEN PRINT@0,"TIME LE
FT: ";:PRINT@11,NQ*K;:PRINT@15,"
SECONDS"
720 IF CB=1THEN GOSUB1000
725 SOUND100,7:TIMER=0
730 FORQ=1TONQ
735 PRINT@234,Q$(Q)+" = "
740 A$=INKEY$:IF A$=""THEN GOSUB
15:GOTO740
745 PRINT@244,A$
746 A=VAL(A$):IFA=CA(Q)THEN760
750 B$=INKEY$:IFB$=""THEN GOSUB
15:GOTO750
755 PRINT@244,A$+B$:A=VAL(A$+B$)
760 IF A=CA(Q) THEN SOUND 100,1
ELSE NW=NW+1:NW$(NW)=Q$(Q)
765 PRINT@234,STRING$(10," "):NE
XTQ
770
800 '***DISPLAY RESULTS***
805 CLS:PRINT:PRINTN$:PRINT"YOU
DID "NQ"QUESTIONS.":PRINT"YOU GO
T "NQ-NW"RIGHT ":PRINT"OR "INT((
NQ-NW)*100/NQ)" PERCENT"
810 MIN=(INT(TIMER/60/60))
815 SEC=INT(TIMER/60)
820 PRINT" IN "MIN;
825 LEFTOVER=SEC-MIN*60
830 PRINT"MINUTES AND "LEFTOVER"
SECONDS."
835 IF SEC<NQ*K THENPRINT:PRINT"
YOU BEAT YOUR TARGET!" ELSEPRINT
"YOU WERE A LITTLE SLOW!"
840 IF NW>0 AND SEC<NQ*K THENPRI
NT"BUT MISTAKES WILL COST YOU!"
ELSE IF NW<NQ/2 AND SEC>NQ*K THE
```


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```
NPRINT"BUT YOU GOT MOST OF THEM
RIGHT!"
845 PRINT"YOU ARE NOW RATED AS"
850 LEV=INT(SEC/NQ+.5):IF NW>0AN
D INT(NW*10/NQ)>1 THEN LEV=LEV+I
NT(NW*10/NQ)ELSE IF NW>0 THEN LE
V=LEV+1:'***SET CRITERION REFERE
NCE AT 100% - TO REDUCE, CHANGE
NW>0 TO NW>NQ*.XX WHERE XX IS DE
SIRED PASS PERCENT
855 IF SEC>NQ*K THEN LEV=LEV+1
860 IF LEV>6 THEN LEV=6
865 PRINTLEV" - "R$(LEV):POKE256
,LEV
870 GOSUB2000
875 '***LIST MISSED PROBLEMS***
880 IF NW=0THEN915
885 IF NW=1THENPRINT"HERE IS THE
 ONLY ONE YOU MISSED:" ELSE IF N
W>1THENPRINT"HERE ARE THE ONES Y
OU GOT WRONG:"
890 FOR X=1 TO NW
895 PRINTNW$(X)
900 IF X/10=INT(X/10)THEN 905 EL
SE IF X<NW THEN NEXT X ELSE GOSU
B2000:GOTO915
905 GOSUB2000
910 NEXTX:GOSUB2000
```


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```
915 CLS:PRINT@227,"PRESS <SPACE>
 TO GO AGAIN.":PRINT@259,"PRESS
<Q> TO QUIT."
920 A$=INKEY$:IFA$=""THEN920ELSE
IFA$="Q"THEN925ELSECLS:PRINT@230
,"JUST A MOMENT, "N$:GOTO200
925 END
930 '
999 '*****DRAW COLOR BAR*****
1000 FOR P=1408 TO 1437:GOSUB100
5:SOUNDP-1300,1:NEXTP:RETURN
1005 IF P>1423THENPOKEP,175
1010 IF P<1424 AND P>1412 THEN P
OKE P,159
1015 IF P>1408 AND P<1413 THEN P
OKE P,191
1020 RETURN
1999 '*****WAIT FOR USER*****
2000 PRINT:PRINT"     PRESS <SPA
CE> TO GO ON."
2005 A$=INKEY$:IF A$<>" "THEN200
5
2010 RETURN
2999 '***MAKE A JOYFUL SOUND***
3000 ' PUT YOUR FAVORITE SONGS O
R SOUNDS HERE
3999 '*****INSTRUCTIONS*****
4000 CLS:PRINT:PRINT:PRINT:PRINT
"SPEED MATH WILL TEST YOUR SKILL
 AND SPEED AT BASIC MATH FACTS."
4005 PRINT"WHEN YOU HEAR THIS SO
UND":PRINT"THE QUESTIONS WILL ST
ART.":GOSUB2000:SOUND200,7
4010 CLS:PRINT:PRINT@96,STRING$(
32,42):PRINT"   THAT'S THE START
ING SOUND."
4015 PRINT:PRINTSTRING$(32,42):G
OSUB2000
4020 CLS:PRINT"LET'S TRY ONE:":P
RINT:PRINT@234,"7 - 2 ="
4025 'PRINT@416,"TYPE THE ANSWER
. IF NOTHING     HAPPENS, PRESS
<SPACE>."
4030 A$=INKEY$:IF A$=""THEN4030
4035 PRINT@244,A$
4040 IF A$="5" THEN SOUND100,1:P
RINT@276,"right":GOTO4045ELSE PR
INT@276,"PRESS <5>":GOTO4030
4045 GOSUB2000
4050 CLS:PRINT:PRINT:PRINT:PRINT
: PRINT"     do not press <ENTER
>":PRINT"     AFTER YOUR ANSWER.
":PRINT:PRINT"IF YOU MAKE A MIST
AKE,DO NOT TRYTO FIX IT UP. JUST
 GO ON TO THE NEXT QUESTION.":PR
INT:PRINT"IF NOTHING SEEMS TO BE
 HAPPENINGPRESS <SPACE>."
4055 PRINT:PRINT"AFTER A GAME OR
 TWO, YOU'LL GET FASTER AT IT."
4060 GOSUB 2000:RETURN
```

The CoCo Composer



A program to let you break out of the single melody line limitations of BASIC.

By Larry Konecky

Have you ever felt frustrated by the limitations of the *SOUND* and *PLAY* commands provided by BASIC? Most of us interested in musical applications of computers would like to "play" with more than single melodic lines. Writing up to four part harmony is now possible on the Color Computer. This capability is provided by the following program.

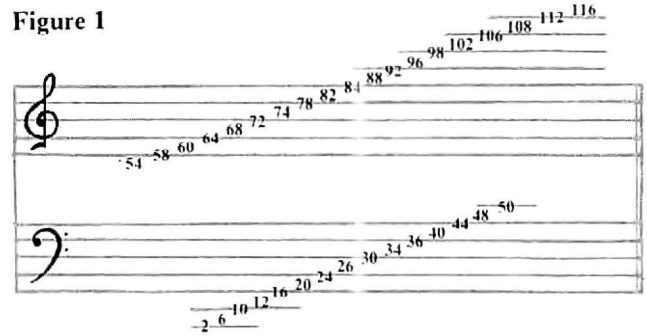
A PCLEAR0 will need to be performed before loading and running the program. If a disk drive is not being used POKE 25,6 and POKE 31,6 to accomplish a PCLEAR 0. If disk drive is being used then POKE 25,14: POKE 26,1 and POKE 3584,0 before loading and running. With disk use *RUN* after loading, as ",R" after the *LOAD* command will not work with the above procedure for a PCLEAR 0.

The listing actually contains two separate programs. The BASIC program contains a machine level program which is poked into memory locations &H2A00 through &H2CA9. Also &H29C0 through &H29D6 are used as reserved spaces for variables. The BASIC program produces and gives control over a "window" which allows numbers to be poked into specific memory locations. These numbers are used to control pitches and lengths of notes to be played. The PCLEAR0 allows room for the machine program to reside above the BASIC program with enough memory left over for BASIC program modification and a piece of music of over 900 four-voice chords with 16K of RAM.

For an assembly listing of the machine program refer to the July issue of *Color Computer News*, 1982, Pages 16 and 17. The listing may also be found in the February issue of *'68' Micro Journal*, 1982, Pages 35 and 36. There are a few slight modifications to the object code as found in the above articles. Differences will be found in memory locations used and the added capability of entering your own musical compositions or other pieces. These programs are based on an algorithm published by Hal Chamberlin in the September 1977 issue of *Byte*.

After entering *RUN* wait a few moments while the machine program is poked into its proper location in memory. After this action has been completed a "window" will be displayed on the screen with labels indicating such items as number of column positions, length and voice placements, and key functions. Press any of the arrow keys to move a black cursor to the desired row or column position for entering digits. Pressing the left or right arrow keys with the cursor at the respective edge will move the window to a new memory location if lower or upper memory limits have not been reached.

Figure 1



Note pitches and lengths are all entered as numbers. To enter these numbers, first position the cursor, then press the space bar. A red cursor will replace the black cursor indicating that digits may now be entered. If a number entered is two digits or less, press E to regain the black cursor and ensure a proper entry. If a number is three digits long, the black cursor will reappear automatically. If a number value is above a preset limit (130 for pitches and 254 for lengths) it will need to be reentered. To edit or change any number just enter the new number over the old number following the above procedures. (Numbers are entered directly into RAM.)

All pitch values need to be even numbers. Refer to Figure

(Larry Konecky holds a master's degree in guitar performance and is working on a doctor of music education degree. He is currently Director of CAI in Music at Alcorn State University.)

1 for a chart indicating corresponding pitches and numbers on a grand staff. To enter sharps or flats, add or subtract a value of two from the selected pitch. Length values can be highly flexible. Multiples of two and/or three are suggested. Some examples of length values are as follows:

= 18 = 36 = 72 = 144

Rests are possible by placing a value (greater than 0) in the length position and leaving the pitch values at 0. Overall tempo changes can be made by adjusting the last *DATA* value in Line 5010 (minimum of 1 to a maximum of 255). This value is presently set at 104.

Pressing D will delete all note and length values in the column in which the cursor is residing. If a large number of notes has already been entered this action may take some time as memory spaces are adjusted. Pressing I will open a memory area between the column before and the present cursor position, allowing insertion of a column of notes. Again, this action may be delayed if a large number of memory spaces needs to be adjusted. Pressing J allows quick access to memory locations not presently being shown by the window. After J is pressed, enter the column number of the area desired.

Press P to sound notes entered. The program will always start at column 1 regardless of the cursor's position. After notes have been sounded the cursor will return to column 1. A zero in the length position will always cause the program to stop sounding notes ("the end").

Press S or L to save or load compositions. Either disk or cassette may be selected for the saving or loading process. Compositions are saved and loaded as machine language programs for efficient use of time and storage space. Once saved, compositions may be loaded as independent programs and listened to using the *EXEC* command.

The upper left-hand numbers on the window screen are memory position indicators. The top number indicates the maximum value to which the cursor has been moved in memory. The lower number indicates the present position in memory towards which the cursor is pointing. A maximum value of 16375 is possible in a 16K Color Computer and 32760 for a 32K Color Computer. The program is presently set for a 32K computer. *If a 16K computer is being used change the value in Line 350 from 32760 to 16375.*

The ambitious reader may want to experiment with the timbre of the sound being produced. This may be done by changing values in the Waveform Table (Lines 1000—1310). If these values are charted in graph form a modified sine wave is formed. Changing the shape of this wave will change the tone color of the sound being produced. Use numbers between 0 and 63, and make sure there are the same amount of numbers as listed (256).

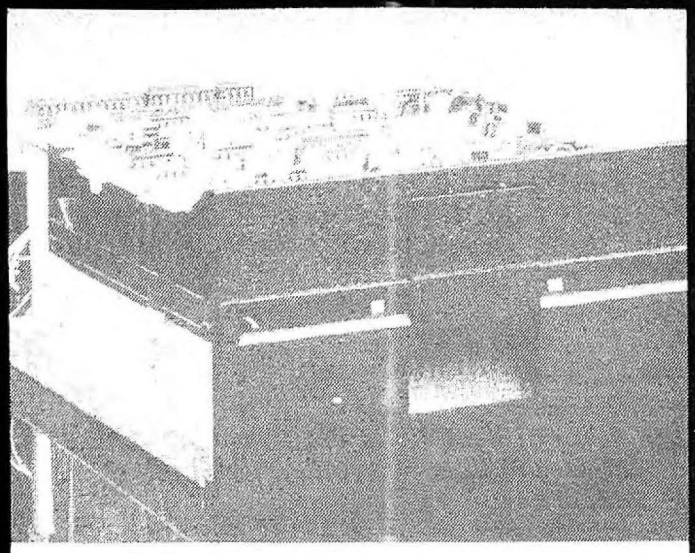
NOTE: *A short arrangement taken from the Nutcracker Suite is included along with the Composer Program on Rainbow On Tape.*

		945	0D76
115	0210	1090	0F69
285	049B	1240	112B
400	0692	1490	1339
580	091E	4040	1589
761	0B28	END	1785

```
1 CLS2:PRINT@101,"*** COCO COMPO
SING ***";
2 PRINT@168," COPYRIGHT-1983 ";
3 PRINT@270," BY ";
4 PRINT@360," LARRY KONECKY  ";
5 CLEAR100,&H29C0
10 M=&H2D00:DIM P(5,5):J=M
20 P$=CHR$(128):C$=CHR$(143):R$=
CHR$(255):B$=CHR$(175)
25 FORA=1TO5:FORB=1TO5:P(A,B)=Q:
Q=Q+1:NEXTB,A
30 FORD=&H2A00 TO &H2B83:READT:P
OKED,T:NEXTD
40 FORD=&H2C00 TO &H2CA9:READP:P
OKED,P:NEXT
50 DEFUSR0=&H2C00
60 GOSUB500:Z=1:S=139:X=1:Y=1:M=
&H2D00
70 GOSUB400:PRINT@S,P$;
99 '* FUNCTION SELECT
100 PRINT@65,M;
101 IFPEEK(341)=247THEN250'UP
105 IFPEEK(342)=247THEN280'DOWN
110 IFPEEK(343)=247THEN320'LEFT
115 IFPEEK(344)=247THEN350'RIGHT
120 IFPEEK(338)=251THEN600'PLAY
125 IFPEEK(341)=251THEN625'SAVE
130 IFPEEK(342)=253THEN700'LOAD
131 IFPEEK(340)=253THEN900'JUMP
132 IFPEEK(339)=253THEN930'INSER
T
133 IFPEEK(342)=254THEN950'DELET
E
135 IFPEEK(345)=247THEN136ELSE10
0'SPACE BAR
136 PRINT@S,R$;:I$=INKEY$:I$=""
137 I$=INKEY$:IFI$=""THEN137
140 N=VAL(I$):C=0
150 PRINT@S,"    ";:PRINT@S,N;
155 FORT=1TO200:NEXTT
160 I$=INKEY$:IFI$=""THEN160ELSE
IFI$="E"THEN195
165 NN=VAL(I$)
175 N=N*10+NN:C=C+1
176 IFN>254THENN=0:GOTO136
180 IFN>130ANDX>1THENN=0:GOTO136
185 IFC=1THENPRINT@S,N;:GOTO160
195 PRINT@S,N;:PRINT@S,P$;:IFY=5
THENPRINT@S+4,B$;
200 POKEM,N:GOTO100
249 '* UP ARROW
250 IFX=1THEN100
255 X=X-1:PRINT@S,C$;:IFX=1THENS
=S-64ELSES=S-32
270 PRINT@S,P$;:M=M-1:GOTO100
279 '* DOWN ARROW
280 IFX=5THEN100
285 X=X+1:PRINT@S,C$;:IFX=2THENS
=S+64ELSES=S+32
```

```
300 PRINT@S,P$;:M=M+1:IFM>J THEN
J=M:PRINT@33,J;
310 GOTO100
319 '* LEFT ARROW
320 IFY=1 AND M<11525THEN100
325 IFY=1THEN340
330 Y=Y-1:PRINT@S,C$;:S=S-4:PRIN
T@S,P$;:M=M-5:GOTO100
340 Z=Z-1:M=M-(P(Y,X)+5):SS=S:S=
139:GOSUB400
345 S=SS:PRINT@S,P$;:M=M+P(Y,X):
GOTO100
349 '* RIGHT ARROW
350 IFY=5AND M>32760THEN100
355 IFY=5THEN380
360 Y=Y+1:PRINT@S,C$;:S=S+4:PRIN
T@S,P$;:M=M+5:IFM>J THENJ=M:PRIN
T@33,J;
370 GOTO100
380 Z=Z+1:M=M-(P(Y,X)-5):SS=S:S=
139:GOSUB400
385 S=SS:PRINT@S,P$;:M=M+P(Y,X):
IFM>J THENJ=M:PRINT@33,J;
390 GOTO100
399 '* WINDOW DISPLAY
400 PRINT@33,J;:PRINT@75,"
                "
405 PRINT@75,RIGHT$(STR$(Z),3)"
";:PRINT@79,RIGHT$(STR$(Z+1),3)"
 ";:PRINT@83,RIGHT$(STR$(Z+2),3)
" ";:PRINT@87,RIGHT$(STR$(Z+3),3
)" ";:PRINT@91,RIGHT$(STR$(Z+4),
3)" ";:PRINT@95,B$+B$;
410 FORA=1TO5:FORB=1TO5
415 N=PEEK(M):IFN=255THENPOKEM,0
:GOTO415
420 PRINT@S,"    ";:PRINT@S,N;:M
=M+1:IFA=5THENPRINT@S+4,B$;
425 IFB=1THENS=S+64ELSES=S+32
430 IFB=5THENS=S-188
435 NEXTB,A:M=M-25:S=139:RETURN
499 '* WINDOW LABELS
500 CLS3:PRINT@12," *(E)NTER MUS
IC* ";
505 PRINT@44,"   (SPACE BAR)   "
;
510 PRINT@129," LENGTH  ";
520 PRINT@193," SOPRANO ";
530 PRINT@225," ALTO    ";
540 PRINT@257," TENOR   ";
550 PRINT@289," BASS    ";
560 PRINT@353," UP,DOWN,LEFT,OR
RIGHT ARROWS ";
570 PRINT@417," (P)LAY ";:PRINT@
428," (S)AVE ";:PRINT@439," (L)O
AD ";
575 PRINT@449," (J)UMP ";:PRINT@
460,"(I)NSERT";:PRINT@471,"(D)EL
ETE";
580 RETURN
```


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```
599 'PLAY MUSIC
600 CLS0:C=USR(0):GOTO60
624 '* SAVE
625 CLS8:PRINT@9," *SAVE MUSIC*
";:GOSUB800
630 IFT=1THENPRINT@8," *SAVE TO
DISK* ";ELSEPRINT@7,"*SAVE TO CA
SSETTE*" ;
660 PRINT@96," 8 OR LESS CHARACT
ERS"
665 INPUT T$
675 FORQ=J+1TOJ+5:POKEQ,0:NEXTQ
680 IFT=1THENSAVEMT$,&H2D00,Q,&H
2D00 ELSE CSAVEMT$,&H2D00,Q,&H2D
00
685 GOTO60
699 '* LOAD
700 CLS4:PRINT@9," *LOAD MUSIC*
";:GOSUB800
710 IFT=1THENPRINT@7," *LOAD FRO
M DISK* ";ELSEPRINT@5," *LOAD FR
OM CASSETTE* ";
735 PRINT@96," (MUST BE EXACT) "
740 INPUTT$
750 IFT=1THEN LOADM T$ ELSE CLOA
DM T$
755 PRINT@199," WAIT ONE MOMENT
";
760 M=&H2D00
761 PE=PEEK(M):IFPE=0THENJ=M:GOT
060
765 M=M+5:GOTO761
770 GOTO755
799 '* DISK OR CASSETTE
800 PRINT@64," SELECT (D)ISK OR
(C)ASSETTE":PRINT@98," PRESS SPA
CE BAR TO RETURN"
810 I$=INKEY$:IFI$=""THEN810
820 IFI$="D"THENT=1:GOTO850
835 IFI$="C"THENT=-1:GOTO850
840 IFI$=" "THEN60ELSE810
850 PRINT@64," ENTER TITLE:":RET
URN
899 '* JUMP
900 PRINT@12,R$" SELECT#        "
R$;:PRINT@22,;:INPUTZ
910 S=139:X=1:Y=1:M=(Z-1)*5+&H2D
00:
920 IFM>J THENJ=M
925 PRINT@12," *(E)NTER MUSIC* "
;B$+B$+B$;:GOTO70
929 '* INSERT
930 PRINT@S,R$+R$+R$+R$;:M=M-(X-
1):J=J+5:FORK=J TOM STEP-1:N=PEE
K(K):POKE(K+5),N:NEXTK:FORK=M TO
(M+4):POKEK,0:NEXTK
935 S=S-(X-1)*32:IFX>1THENS=S-32
940 X=1:M=M-P(Y,X):SS=S:S=139:GO
SUB400
945 M=M+P(Y,X):S=SS:PRINT@S,P$;:
GOTO100
949 '* DELETE
950 PRINT@S,R$+R$+R$+R$;:M=M-(X-
1):FORK=M TOJ:N=PEEK(K+5):POKEK,
N:NEXTK:J=J-5
960 S=S-(X-1)*32:IFX>1THENS=S-32
970 X=1:M=M-P(Y,X):SS=S:S=139:GO
SUB400
980 M=M+P(Y,X):S=SS:PRINT@S,P$;:
GOTO100
999 '*WAVEFORM TABLE
1000 DATA 13,14,15,17,18,20,21,2
2
1010 DATA 24,25,27,28,29,31,32,3
4
1020 DATA 35,38,39,41,42,43,45,4
6
1030 DATA 48,49,50,52,53,55,56,5
6
1040 DATA 57,59,59,60,60,62,62,6
2
1050 DATA 63,63,63,63,63,63,63,6
2
1060 DATA 62,62,60,60,59,59,57,5
6
1070 DATA 55,55,53,52,50,49,48,4
6
1080 DATA 46,45,43,42,41,39,38,3
6
1090 DATA 35,34,32,31,31,29,28,2
7
1100 DATA 27,25,25,24,24,22,22,2
1
1110 DATA 21,21,21,21,21,21,21,2
1
1120 DATA 21,21,21,21,22,22,22,2
4
1130 DATA 24,24,25,25,26,26,27,2
7
1140 DATA 27,28,28,30,31,31,32,3
2
1150 DATA 34,34,34,34,34,35,35,3
5
1160 DATA 35,35,35,35,34,34,34,3
4
1170 DATA 32,32,32,31,31,29,29,2
8
1180 DATA 28,27,25,25,24,22,21,2
1
1190 DATA 20,18,18,17,15,14,14,1
3
1200 DATA 11,11,10,08,08,07,07,0
6
1210 DATA 06,04,04,03,03,03,01,0
1
1220 DATA 01,01,01,01,00,00,00,0
0
1230 DATA 00,01,01,01,01,01,01,0
1
1240 DATA 03,03,03,03,03,04,04,0
```

```
4
1250 DATA 04,04,06,06,06,06,06,0
6
1260 DATA 06,06,07,07,07,07,07,0
7
1270 DATA 07,06,06,06,06,06,06,0
6
1280 DATA 06,06,04,04,04,04,04,0
4
1290 DATA 04,04,04,04,03,03,03,0
4
1300 DATA 04,04,04,04,04,06,06,0
6
1310 DATA 07,07,07,08,10,10,11,1
3
1399 '*NOTE TABLE
1400 DATA 0,0,2,111,2,148,2,187
1410 DATA 2,228,3,16,3,63,3,113
1420 DATA 3,165,3,220,4,23,4,86
1430 DATA 4,152,4,221,5,40,5,118
1440 DATA 5,201,6,33,6,127,6,226
1450 DATA 7,74,7,185,8,47,8,172
1460 DATA 9,48,9,187,10,80,10,23
7
1470 DATA 11,147,12,67,12,254,13
,196
1480 DATA 14,149,15,115,16,95,17
,88
1490 DATA 18,96,19,119,20,160,21
,218
1500 DATA 23,38,24,135,25,252,27
,136
1510 DATA 29,43,30,231,32,190,34
,176
1520 DATA 36,192,38,239,41,64,43
,180
1530 DATA 46,77,49,14,51,249,55,
16
1540 DATA 58,87,61,207,65,124,69
,96
1550 DATA 73,129,77,223,82,129,8
7,105
1560 DATA 92,155,98,29
2000 '*INITIALIZE
2010 DATA 134,63,183,255,35
2020 DATA 142,42,00
2030 DATA 191,41,195,191,41,198
2040 DATA 191,41,201,191,41,204
2050 DATA 142,45,0,191,41,192
2060 DATA 126,44,155
3000 '*READ LENGTH
3010 DATA 190,41,192,166,128
3020 DATA 183,41,194,57
4000 '*GET NOTES FROM TABLE
4010 DATA 49,141,254,214,166,128
4020 DATA 238,166,255,41,207,166
,128
4030 DATA 238,166,255,41,209,166
,128
4040 DATA 238,166,255,41,211,166
,128
4050 DATA 238,166,255,41,213
4060 DATA 191,41,192,57
5000 '*PLAY
5010 DATA 16,142,0,104
5020 DATA 166,159,41,195,171,159
,41,198
5030 DATA 169,159,41,201,169,159
,41,204
5040 DATA 183,255,32
5050 DATA 252,41,196,243,41,207,
253,41,196
5060 DATA 252,41,199,243,41,209,
253,41,199
5070 DATA 252,41,202,243,41,211,
253,41,202
5080 DATA 252,41,205,243,41,213,
253,41,205
5090 DATA 49,63,38,7
5100 DATA 122,41,194,39,12,32,18
6
5110 DATA 166,132,32,0
5120 DATA 32,0,32,0,32,180,57
6000 '*MAIN CONTROL
6010 DATA 23,255,127,129,0
6020 DATA 38,1,57
6030 DATA 23,255,128,141,162
6040 DATA 32,241
```


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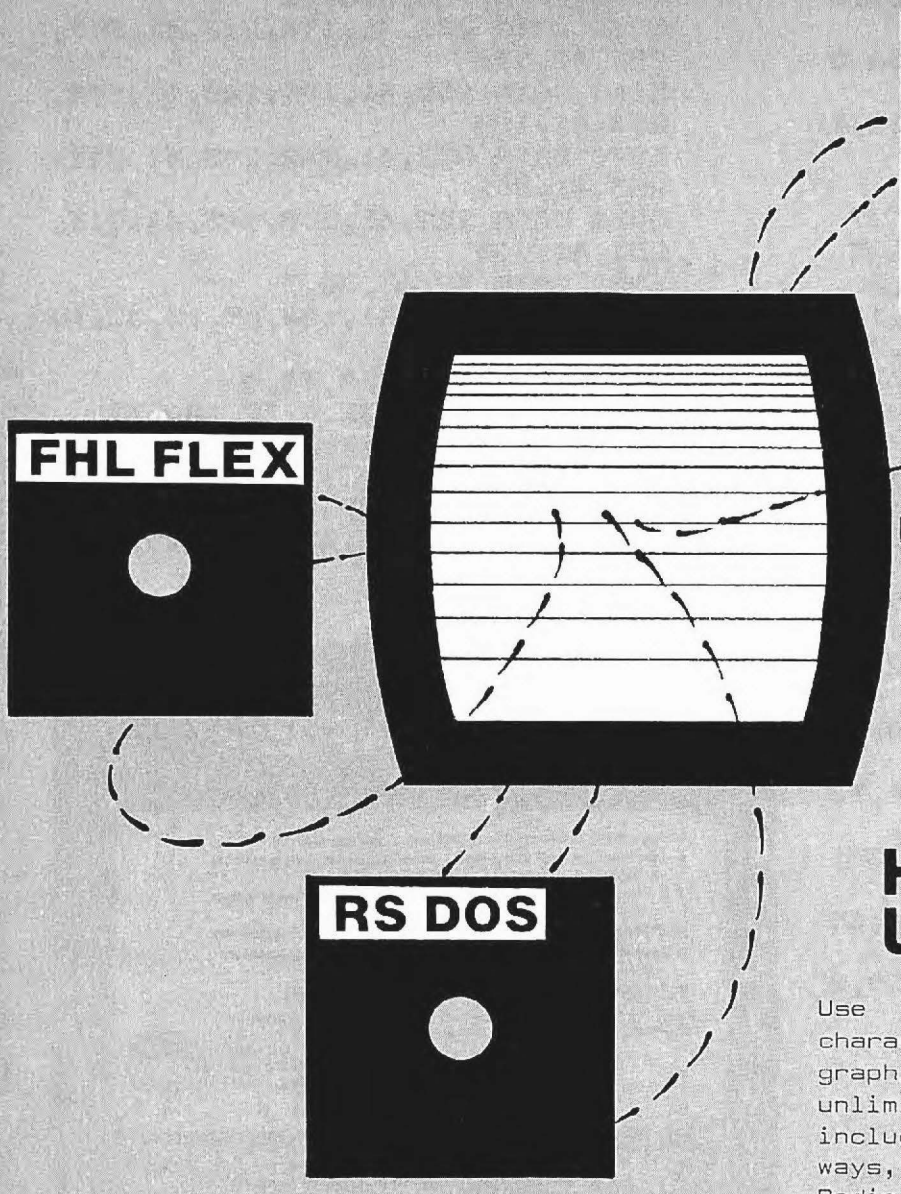
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Debugging Can Be Fun

By Joseph Kolar
Rainbow Contributing Editor

Keying in listings of promising programs that appear in *the Rainbow* is quite a chore — one approached reluctantly by many newcomers.

The good news is that it can be interesting and fun. In fact, copying listings found between the covers of *the Rainbow* is encouraged. It is a fine learning process. While in the process of keying in a listing, the mind is busily engaged in figuring out the significance of the program lines and how they fit into the program.

Think of it as a mental jigsaw puzzle. The program lines are pieces and you are trying to fit them together to make a complete picture.

We might as well develop a system to help us key in programs.

Anybody who types listings will make plenty of errors. This means the copied listing must be purged of all mistakes. You will make your share of them. You will have to debug your own work. Hold on! It isn't that bad! You will find that is the most satisfying part of the entire operation. Finding and correcting mistakes are good learning experiences.

The object is to make your copy of the listing identical to the original one. This means it must be copied exactly as published.

Rule one is to assume that the listing is correct as published and if you copy it exactly, it will perform as expected.

Before tickling the tiles, there are a few preparations to attend to.

Check the listing to see if your CoCo can handle it. Enough memory? Extended BASIC?

Put a blank, trial tape in the cassette recorder. Rewind to 000 and advance it to 010.

Get an overview. Look over the description of the program to familiarize yourself with it. After reading the text, read through the listing. Often you will come across lines and routines that ring a bell.

Now, tickle away! After you key in some lines, *RUN* and see if you get anything on the screen. Sometimes you will and sometimes you won't. You may get an SN Error message in some line. That's good! Correct it. Other error messages are likely to come up and we will consider them later.

One message you are likely to get is the UL Error in some line. It usually means that the computer is directed to some line you haven't reached yet. It is good to see the beginning of the program because it is often text or a graphic title. These are easy to touch up. Thus, you may put a temporary ' marker in front of the UL line and *RUN* to see if you get any display. If you do get a display, you will have to put some loop to hold the display, using numbers that are beyond the lines used: 20000 GOTO 20000. That way, if you do not remove it, it won't interfere with the program. Check it to see if it appears okay. For example, if it is a graphic square, is it distorted or incomplete? If so, look for the appropriate line and compare with the listing. You may have copied numbers wrong. The computer will not point to the mistake, but the unsatisfactory result will be one big hint.

Just remember to remove any temporary *REM* markers before continuing.

While you are still in the early part of the program, it is best to correct any errors. Later on, as more and more of your program is completed, it gets confusing to look for "up front" errors.

Let's assume that you are satisfied with your work thus far. *CSAVE* what you have keyed in. Make two copies. I call each temporary save one; two; etc., and keep a working list on a piece of paper on top of the computer between the air vents. Make a note of the name of the program. These simple names for temporary storage of a program in progress of being listed saves time dreaming up titles.

Every now and then, take a break. Make two copies of the work in progress. Frequent *CSAVEs* are insurance so that if the lights go out or you lose the program in memory, you won't have to go to square one and repeat your efforts.

When you complete the listing and *RUN* it, you will surely have some bugs in it. Before debugging your work, make two more *CSAVEs*. Then look at the program to see what error clues show up.

There is a good probability that you typed in incorrect numbers, variables, operators, (+, -, <, = etc.).

You will come to the point when you will have to *LIST* through the program and compare your screen lines with the original listing. One way is to *LIST* by increments: *LIST*—100 then *LIST* 100—200. Then, *LIST* 200—300; etc.

I don't like this forward-running system. There is a tendency to lose the lines on top of the screen display if the line group listed is lengthy. And, you know where all the mistakes are, don't you? They are always in the line you failed to check out.

I prefer to *LIST* to the end of the program and work backwards to the beginning. Note the program line number of the uppermost, complete line on the screen. Make a check

---

(Joseph Kolar is a free-lance writer and programmer dedicated to proselytizing for computers in general, and the CoCo specifically.)

mark next to this line number, in pencil, on the original listing. Compare the original and the lines shown on the screen. If it is okay, then *LIST* the number you checkmarked on the listing.

Again, checkmark the number of the topmost, complete program line on the screen. Compare, correct, and now proceed.

At first, there will be a slight delay as the program scrolls to the high line numbers. But, you will be systematically checking every line in the program.

As you verify each line, press [ENTER] so that the line you are currently checking is at the top of the screen.

If you find an error, correct it. Then *RUN* to see if it solved any problem. If the bug persists, you must *LIST* the highest line number appearing on the screen (same number you ticked off on the listing). Why? When you edited a line containing an error, the listing scrolled up, and some unverified lines were lost. It's better to be safe than sorry. So what, if you compare a set of lines twice?

An occasional SN Error message may be encountered as you *RUN* the program, because the SN line might not have been called and, thus encountered by the computer. Correct them as they appear.

After you correct a few mistakes, make a few more *CSAVEs*. It doesn't cost anything to make these trial saves.

Finally, after you zeroed in on that last bug, *RUN* the program a few times, trying out all of the options and check all of the possible results. When you feel you have a good program, make two more trial copies to tape. Then make two good copies on a permanent tape and list it in your "tape register" (discussed in the March 1983 issue). Only then erase your trial tape!

Do not anticipate the author of the listing. You may think you know better than he does. For instance, the author lists:

```
10 A$="R4; D1; F1; D4"
```

You say, "He could have listed it":

```
10 A$="R4D4F4"
```

True, he could have left out the spaces, omitted the semicolon and dropped the ones because no number defaults to one. However, the author wrote his listing so the inexperienced novice could read and understand the listing and he spaced between elements for easy legibility. Secondly, trouble is brewing when you make anticipatory changes when you are hunting down mistakes. The lines are not identical and you must read back and forth from the listing when comparing. It will slow down the process.

Don't combine lines to make multiple-line statements. You may cause yourself some grief.

Other common errors appear when you omit a line or lines, or if you omit one or more statements in a multiple statement program line.

Key in Listing 1. The object is to create a flashing rectangle in a flashing diamond in a flashing octagon.

Read and follow instructions in the *REM* lines at 170—220.

Key in Listing 2. Exactly, right? Errors and all! See if you can work out the errors.

Let me talk you through it. *RUN*. There is an SN Error in 10. Correct it and *RUN*. Next, there will be a UL Error in 95, so correct it by deleting the line or play it safe and put a ' marker in front of this line.

This error was inserted to demonstrate what could happen if you keyed in part of a program where a line called a line you didn't reach yet. *RUN*.

A diamond appears momentarily and then [OK]. This indicates the rectangle didn't show. Look for an error in that portion of the program. The solution is to take the ' marker out of Line 80 and *RUN* (FC Error in Line 80). It looks okay, so check lines that have A$ defined. The line is 20. Noting W is incorrect, change it to "D" and *RUN*. Note: If you left out BM in Line 80, you would also get an FC Error.

Now, you get the rectangle and the diamond, but they are not centered. Check both *DRAW* lines that print them to see which one is off. Correct it and *RUN*.

The rectangle and diamond are okay, but still no triangle. Check Line 130 that draws the triangle. It looks correct. You note in comparing your listing with the author's listing that Lines 140—160 are combined into Line 130 and Lines 140—160 are either ' or deleted. Copy the author's Lines 130—160. The error was that Line 70 directed the computer to go to Line 140. In our example, because we *REMmed* Lines 140—160, it went through them and stopped with an [OK]. If Lines 140—160 were deleted, a UL Error in 70 would be the result. Which says something about taking liberties with the author's listing. The solution is to copy the listings exactly and *RUN*.

The only trouble is that you still have no octagon. Look for the octagon shape variable and the line that draws it. In Line 60, D$ creates the octagon. Line 140 draws C$. Change Line 60 to C$ or change Line 140 to D$, if you insist on fooling with the listing. *RUN*.

Now, it is running properly.

This demo listing is a shortened version of a "real" listing. It gives you some clues on error messages and typing mis-

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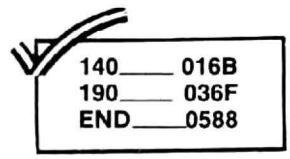
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takes you may make in the normal course of copying a listing.

Admit that it is interesting to debug your own copy of a listing. From now on, rather than shrink from the chore of keying in long listings, expect to have fun.



Listing 1:

```
0 'ERROR MESSAGE EXAMPLES. READ
REMS STARTING AT LINE 170 AND GO
THROUGH THEM ONE AT A TIME.
10 PMODE4,1:PCLS:SCREEN1,1
20 A$="R10D5L10U5"'RECTANGLE
30 GOTO 80
40 B$="E10F10G10H10"'DIAMOND
50 GOTO 110
60 C$="U10E10R10F10D10G10L10H10"
'OCTAGON
70 GOTO 140
80 DRAW"BM123,96"+A$
90 FOR X=1 TO 200:NEXT
100 GOTO40
110 DRAW"BM118,98"+B$
120 FOR X=1 TO 100:NEXT
130 GOTO 60
140 DRAW"BM113,103"+C$
150 FOR X= 1 TO 200:NEXT
160 GOTO 10
170 '***YOU CAN MAKE THE FOLLOW-
ING CHANGES TO CREATE ERROR
MESSAGES: DELETE 'P' IN <PMODE>
IN LINE 10.  <RUN>  CORRECT IT!

EXCHANGE A 'W' FOR THE 'D' IN
LINE 20.  <RUN>  CORRECT IT.
180 '***PUT A <'> IN FRONT OF
LINE 80 TO SIMULATE OMITTING A
PROGRAM LINE.  <RUN> AND NOTE
THE DISPLAY.  REMOVE <'>.
190 '***DELETE THE <$> IN LINE
140.  <RUN>  REPLACE <$>.

INSERT <95 GOTO 300>.  <RUN> DEL
ETE LINE 95.
200 '*** CHANGE EITHER '8' TO
'0' IN LINE 110 TO SIMULATE TYP-
ING AN INCORRECT NUMBER.  <RUN>
REPLACE '8'.

CHANGE THE <C$> IN LINE 60 TO
EITHER 'B$' OR 'D$'.  <RUN>  RE-
PLACE <C$>.
210 '*** SIMULATE A MULTI-STATE-
MENT ERROR BY CHANGING LINE 130
BY ADDING <:DRAW"BM113,103"+C$:F
OR X=1 TO 200:NEXT:GOTO 10>.
THEN PUT <'> IN FRONT OF LINES
140;150;160 TO SIMULATE DELETION
OF THOSE LINES. <RUN>.
220 '***DELETE WHAT YOU ADDED TO
LINE 130 AND REMOVE THE <'> FROM
LINES 140;150;160.
```


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Listing 2:

```
10 MODE4,1:PCLS:SCREEN1,1
20 A$="R10W5L10U5"'RECTANGLE
30 GOTO 80
40 B$="E10F10G10H10"'DIAMOND
50 GOTO 110
60 D$="U10E10R10F10D10G10L10H10"
'OCTAGON
70 GOTO 140
80 'DRAW"BM123,96"+A$
90 FOR X=1 TO 200:NEXT
95 GOTO 300
100 GOTO40
110 DRAW"BM118,90"+B$
120 FOR X=1 TO 100:NEXT
130 GOTO 60:DRAW"BM113,103"+C$:F
OR X=1 TO 200:NEXT:GOTO10
140 'DRAW"BM113,103"+C
150 'FOR X=1 TO 200:NEXT
160 'GOTO 10
```



Greetings!

Last month as you may recall, I did some various kinds of state-of-the-art art with *LOGO* on my Color Computer. Well, I don't know how it worked out with you, Dwight and Bea, but judging from the avalanche of letters I received, a lot of people liked it.

By the way, I should mention that I try to answer every letter I receive personally, but lately I've fallen behind (Apres le deluge, as the English say). Please be patient.

In any case, I put my art — my dogs, cats, and snakes — to the ultimate test. I showed them to Ben. Guess what? They failed the test.

Ben had hardly glanced at the screen when his eyes frosted over, and his lids slid down slowly over his frosted eyes like two awnings being unfurled in front of an ice cream shop on a sunny day. He groaned softly, let a long sigh of boredom curl out through the tunnels of his two nostrils, and promptly fell asleep — on my foot, no less!

All Woofensburgers are stubborn, and Uncle Bert is no exception. So I vowed to improve my art at least to the point where Ben wouldn't fall asleep instantly. Let me show you the results — and, by the way, you send me any ideas you have. I gave up entirely on the dog in the kennel with the fly buzzing around his nose; though that was pretty complete. In case you don't remember the cat and the snake, the following is how I did them last month:

```
TO CIRCLE2
   REPEAT 12 (FD 6 RT 30)
   END

TO CIRCLE3
   REPEAT 12 (FD 4 RT 30)
   END

TO CATEAR
   FD 17 RT 135 FD 11
   LT 90 FD 11
   RT 135 FD 17
   END

TO CATHEAD
   CIRCLE3
   CATEAR
   END

TO CATBODY
   PU LT 20 FD 10 PD
   CIRCLE2
   END

TO CATTAIL
   LT 20
   REPEAT 6 (FD 6 LT 30)
   END

TO CAT
   CATHEAD
   CATBODY
   CATTAIL
   END

TO CIRCLECAT
   PU BK 50 PD
   REPEAT 9 (CAT)
   END

TO CIRCLECAT2
   PU BK 60 PD
   REPEAT 10 (CAT RT 4)
   END
```

(W. Bert Woofensburger ("Uncle Bert") manages his own hog and corn farm near Ypsilanti, Mich. He has recently acquired a Color Computer and is learning LOGO. Woofensburger's editor and assistant, Dale Peterson, writes for a living, and his recent books include "Genesis II: Creation and Recreation with Computers" and "Intelligent Schoolhouse: Readings On Computers and Learning." He is currently working on a book about Color LOGO with Don Inman and Ramon Zamora, to be published in 1984.)

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```
TO CIRCLE4
   REPEAT 12 (FD 3 RT 30)
   END

TO SNAKEPOSITON
   PU RT 90 FD 10 LT 90 PD
   END

TO HALFCIRCLE
   REPEAT 6 (FD 4 RT 30)
   END

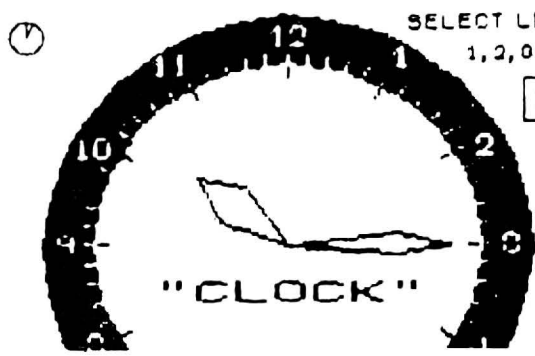
TO HALFCIRCLE2
   REPEAT 6 (FD 4 LT 30)
   END

TO BODY
   REPEAT 3 (HALFCIRCLE HALFCIRCLE2)
   END

TO SNAKE
   CIRCLE4
   SNAKEPOSITION
   BODY
   END

TO SNAKERETURN
   PU LT 90 FD 94 RT 90 PD
   END

TO SPINSNAKE
   REPEAT 10 (SNAKE SNAKERETURN LT 36)
   END
```

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```
TO SPINSNAKE2
   SNAKE HOME LT 36
   SNAKE HOME LT 72
   SNAKE HOME LT 108
   SNAKE HOME LT 144
   SNAKE HOME LT 180
   SNAKE HOME LT 216
   SNAKE HOME LT 252
   SNAKE HOME LT 288
   SNAKE HOME LT 324
   SNAKE HOME LT 360
   END
```

Now, the first thing I thought I would do was add a little flashing effect. I figured I could do that by inserting a *CLEAR* instruction here and there. With the *CIRCLCAT,* I did the following:

```
TO CIRCLECAT3
   PU BK 50 PD
   REPEAT 9 (CAT CLEAR)
   END
```

Not exactly the effect I was seeking. My idea had been to get the cat flashing on and off as it circled around — but as you can see, the first thing I discovered about the *CLEAR* command is that it sends the turtle back home. I mean, it clears everything; not just the picture. Back to the drawing board.

Well, I then remembered my *SPINSNAKE2*, which already had the turtle going home as part of its series of commands. So I simply substituted a *CLEAR* for every *HOME* in the *SPINSNAKE2.* I got something like this:

```
TO SPINSNAKES
   SNAKE CLEAR LT 36
   SNAKE CLEAR LT 72
   SNAKE CLEAR LT 108
   SNAKE CLEAR LT 144
   SNAKE CLEAR LT 180
   SNAKE CLEAR LT 216
   SNAKE CLEAR LT 252
   SNAKE CLEAR LT 288
   SNAKE CLEAR LT 324
   SNAKE CLEAR LT 360
   END

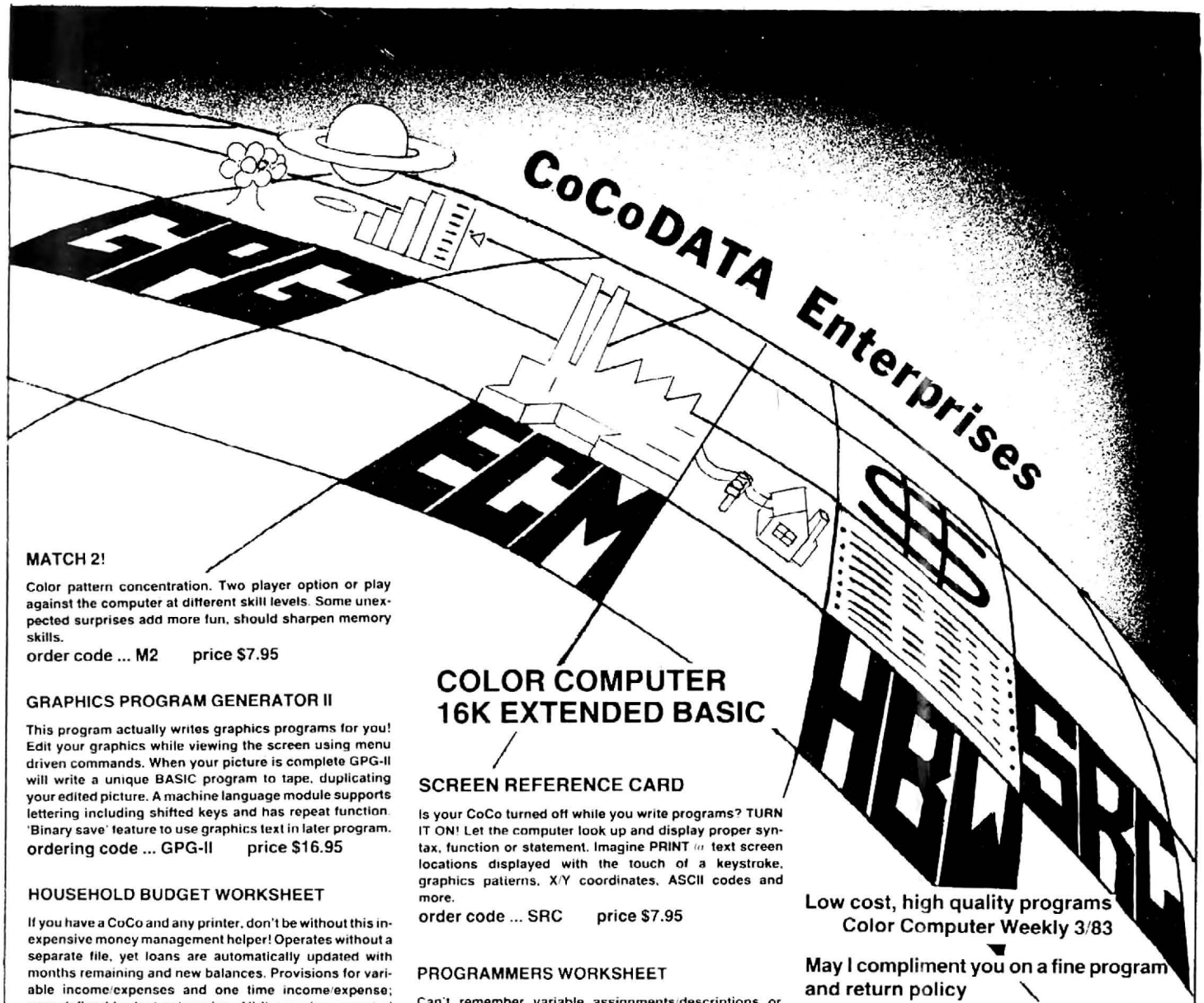
TO SPINSNAKE4
   REPEAT 4 (SPINSNAKE3)
   END
```

That was more or less neat, although I wanted it to go faster (like a real snake). There were a couple of things I thought of, as I watched *SPINSNAKE4* go through his or her paces. First of all, I realized I didn't need that final LT 360, since that just placed the turtle in the home direction; and *CLEAR* did the same. A minor matter.

Second, I thought maybe I would try a little color change, just to see what would happen.

So I tried this:

```
TO SPINSNAKES
   SNAKE PC 1 HOME LT 36
   SNAKE PC 2 HOME LT 72
   SNAKE PC 3 HOME LT 108
   SNAKE PC 0 HOME LT 144
   SNAKE PC 1 HOME LT 180
   SNAKE PC 2 HOME LT 216
```



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```
SNAKE PC 3 HOME LT 252
SNAKE PC 0 HOME LT 288
SNAKE PC 1 HOME LT 324
SNAKE PC 2 HOME
END
```

That didn't work so well, and I confess it took me a while to figure out why. Why? Blame it on that fresh little *HOME* command — not only does it wipe out position, but it seems to wipe out color.

Am I right? Fortunately, this seemed like a good place to practice my deleting with the editor (pressing *SHIFT* and left arrow at the same time). So I went down and deleted all the *PCs*, and put them so they followed instead of preceded the *HOME* command. After that, my program for SPINSNAKE5 looked like this:

```
TO SPINSNAKE5
   SNAKE HOME LT 36 PC 1
   SNAKE HOME LT 72 PC 2
   SNAKE HOME LT 108 PC 3
   SNAKE HOME LT 144 PC 0
   SNAKE HOME LT 180 PC 1
   SNAKE HOME LT 216 PC 2
   SNAKE HOME LT 252 PC 3
   SNAKE HOME LT 288 PC 0
   SNAKE HOME LT 324 PC 1
   SNAKE HOME PC 2
   END
```

I tried that and it wasn't very spectacular, but it became more spectacular when I learned to type *"COLORSET1"* in the *RUN* mode before starting anything. The results were beginning to be the kind of thing Ben might find interesting, although I wasn't quite ready to put it to the test. I did notice that whenever the pen color reached number 3 (*PC3*), it was the same color as the background, and so the turtle went through the motions but I couldn't see the results. I thought that might be a useful observation for later, but for now I decided to delete *PC3*. I went back over *SPINSNAKES* and changed the sequence of pencolors to 0, 1, 2, 0, 1, 2, and so on.

I tried that. That was more interesting. Then I decided I liked pen color 1 the best. So I tried to do it all in that color. First, I began with this:

```
TO SPINSNAKE
   PC 1 SNAKE HOME LT 36
   SNAKE HOME LT 72
   SNAKE HOME LT 108
   SNAKE HOME LT 144
   SNAKE HOME LT 180
   SNAKE HOME LT 216
   SNAKE HOME LT 252
   SNAKE HOME LT 288
   SNAKE HOME LT 324
   SNAKE HOME
   END
```

But I quickly discovered once again (!!!) that every time the old turtle goes home he or she loses his or her old pencolor and has to be reminded once more. So, *SPINSNAKE6* wound up being like this:

```
TO SPINSNAKE6
   PC 1 SNAKE HOME LT 36
   PC 1 SNAKE HOME LT 72
   PC 1 SNAKE HOME LT 108
   PC 1 SNAKE HOME LT 144
   PC 1 SNAKE HOME LT 180
   PC 1 SNAKE HOME LT 216
   PC 1 SNAKE HOME LT 252
   PC 1 SNAKE HOME LT 288
   PC 1 SNAKE HOME LT 324
   PC 1 SNAKE HOME
   END
```

Next, I tried changing the background color a few times by doing this:

```
TO SPINSPIN
   BG 0 SPINSNAKE6
   BG 1 SPINSNAKE6
   BG 2 SPINSNAKE6
   BG 3 SPINSNAKE6
   END
```

That was fun; and as I already knew, when the background color shifted to the same color as the pen, everything went black. I decided to see if I could make the snake seem to erase itself, by playing with my two favorite pen colors. By that time I was sick of all that typing, however, so I reverted to an earlier and simpler version of *SPINSNAKE* that seemed not as nice, but was indeed easier to type. That version goes like this (with the two pen colors added):

```
TO SPINSNAKE7

   PC 1 REPEAT 10 (SNAKE SNAKERETURN
    LT 36)
   END
```




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```
TO SPINSNAKE8
   PC 2 REPEAT 10 (SNAKE SNAKERETURN
    LT 36)
   END
```

Then, I combined the two with a single background color, so it worked out like this:

```
TO SPINSPIN2
   BG 2
   SPINSNAKE7
   SPINSNAKE8
   END
```

Well, that was something close to what I was looking for — but I was still sure Ben wouldn't be interested. I decided to return to the cat image. Here's what I did with the cat:

```
TO CIRCLECAT3
   PC 1
   CIRCLECAT2
   END
```

But it didn't work out so well. It seemed that my hard won positioning of the cat on the screen was quickly cancelled by something, so that I kept getting a flashing cat in the middle of the screen. I thought and thought and thought and — at last a stroke of genius! — I realized I already had a *CIRCLECAT3* procedure (above), and the computer kept choosing that one because it was first in line. Close hand; make fist; strike head; begin again:

```
TO CIRCLECAT4
   PC 1
   CIRCLECAT2
   END
```

That worked just fine, and I went on to bigger and better things:

```
TO CIRCLECAT5
   REPEAT 10 (CAT RT 4)
   END

TO CIRCLECAT6
   CIRCLECAT4
   PC 2 CIRCLECAT5
   PC 3 CIRCLECAT5
   PC 0 CIRCLECAT5
   CLEAR
   END

TO SETCAT
   PU BK 60 PD
   END

TO CATCYCLE1
   PC 1 CAT RT 4
   PC 2 CAT RT 4
   END

TO CATCYCLE2
   PC 3 CAT RT 4
   PC 1 CAT RT 4
   END

TO CIRCLECAT7
   CIRCLECAT6
   SETCAT
   REPEAT 5 (CATCYCLE1)
   REPEAT 5 (CATCYCLE2)
   PC 3
   CIRCLECAT5
   PC 1
   CIRCLECAT5
   END
```

And just for good measure, I tried this variation:

```
TO CIRCLECAT8
   CIRCLECAT7 CLEAR
   BG 2 CIRCLECAT7 CLEAR
   BG 0 CIRCLECAT7
   END
```

Finally, I tried my hand at a little cubism (move over Pablo!):

```
TO CIRCLECAT9
   SETCAT
   REPEAT 20 (CIRCLECAT5 RT 90 FD 1 LT 90)
   END

TO CIRCLECAT5A
   PC 1 REPEAT 10 (CAT RT 4)
   END

TO CIRCLECAT5B
   PC 2 REPEAT 10 (CAT RT4)
   END

TO CIRCLECAT10
   SETCAT
   BG0
   REPEAT 10 (CIRCLECAT5A RT 90 FD 1 LT 90
   CIRCLECAT5B RT 90 FD 1 LT 90
   END
```

To be truthful, by the time I had reached *CIRCLECAT10*, I was a little tired of circles, snakes, and cats. Still and all, I resolved to try this last one out on Ben. What do you think happened? He just wasn't very interested. I thought about that one and realized I had to get his attention first.

Bertha has some Essence of Cat perfume. I put some of that around the screen, and definitely Ben was interested. I know that they have *LOGO*-style programs for composing music, as well as drawing pitures. The next step ought to be a *LOGO* of smells. I'll just toss that suggestion out there, and see if anyone wishes to pursue it. I remain,

Uncle Bert

P.S. You can send your cards and letters to me in care of my good friend Dale Peterson. Just address them like this:

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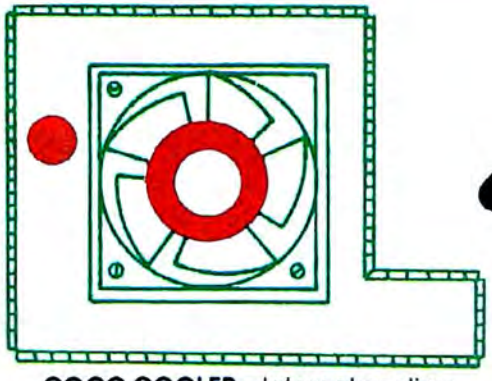
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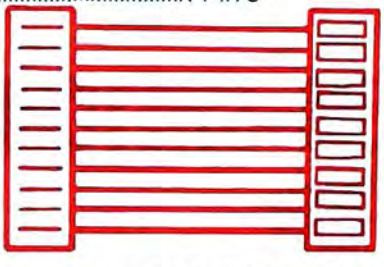
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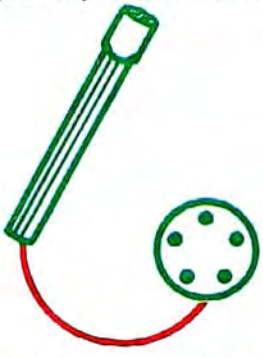
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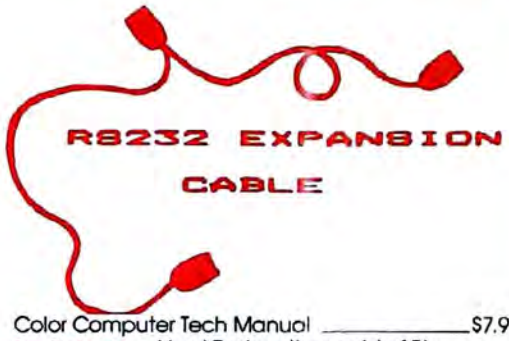
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ENTER THE DRAGON

By Fred Scerbo

As the TRS-80 Color Computer enters its third big year, it was only natural to expect that this powerful and popular home computer would spawn imitators or emulators. Tandy tried this route itself with the release of the TDP-100, only later to withdraw the model after finding out it was not feasible to compete with itself.

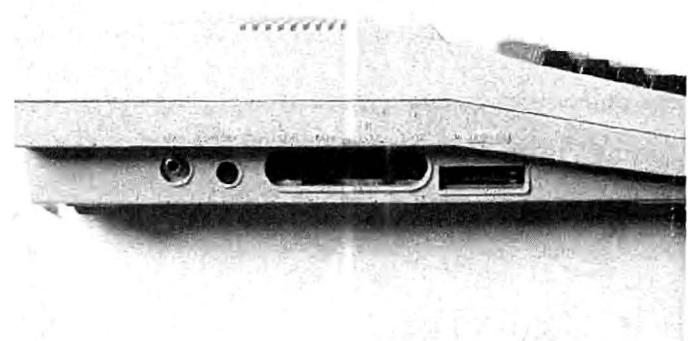
Well, the first real challenger to the CoCo's throne has finally arrived in the form of the Dragon by Tano, the U.S. version of the Microsoft Color Computer which has captured the British market, and if the initial evaluation models are any indication, then even the new 64K Color Computer has some competition in store.

I have long been a strong advocate of the Color Computer. However, working in the field of education has made it difficult to convince other educators that the CoCo, in its battleship silver, push-button case with a 32K BASIC memory, is much more than a toy, especially when compared to the more attractively cased but less powerful 48K Apple II. The new CoCo, of course, is packaged in a fawn gray case with multi-color, full-size keys.

Well, it appears that the Dragon has solved both of these perceived weaknesses head on by placing a Color Computer clone under what is essentially an Apple II case and keyboard and jumping its 64K memory to allow for a full 48K while still in Extended Color BASIC. This simple cosmetic alteration and memory expansion makes the Dragon a competitor, not only in the home market, but in the fiercely competitive educational market as well.



The DRAGON keyboard has the same layout as the Color Computer yet uses a real touch-typist style keyboard. In the 48K mode, all keys become auto-repeat keys: a real plus when you want to edit.



The left side of the DRAGON includes the TV output, reset button, left and right joystick connections, Serial I/O, Tape I/O and, best of all, a parallel printer output.

Let us take a closer look at the Dragon's case first.

Physically, the Dragon is not as wide as the Color Computer, shaving about 2 inches off the width. This difference it makes up by adding a little over an inch in length. The case is much higher than the CoCo and has a much greater slope at the keyboard which has contoured keys that remain level in spite of the slope. The keyboard is very much like a Model III keyboard and is more suitable for touch typists than some of the CoCo replacement keyboards and even the new 64K Color Computer keyboard. The keys are gray with white characters, contrasting perfectly with the case's mochatan color.

The right-hand side of the case contains the ROM pack port, which does not have the CoCo's familiar swinging door. Instead, the port remains open in a rectangular tunnel

(Fred Scerbo is a special needs instructor for the North Adams Public Schools. He holds a master's in education and has published some of the first software available for the Color Computer through his software firm, Illustrated Memory Banks.)

which will prevent ROM packs or a disk interface from being improperly inserted. (No more pop goes the CPU!)

The left-hand side contains the majority of the most commonly used connections, including joysticks, tape I/O, serial I/O (RS 232), the TV RF output jack, the reset button and, best of all, a parallel printer output. This logical side placement of these devices is a welcome relief to anyone who has fumbled over trying to switch joystick connections or stabbed blindly for the reset button on a CoCo. Yet, it'll definitely give more "cord clutter" on the table top than does CoCo.

Only three devices appear on the very rear of the Dragon: the channel ¾ selector, a 5-pin DIN jack for a monitor connection, and the port for the transformer power supply. Since the power supply to the Dragon is an external supply, the Dragon weighs considerably less than the CoCo. What makes the external transformer so attractive in this case is the fact that it contains an ON/OFF switch on top of the transformer case. This is beneficial in two ways: first, the power switch can be placed in a location where it can be more easily accessed for a cold start and, secondly, the transformer does not draw power while plugged in though not in use like some other external units. The socket for the power supply on the Dragon case is identical to an Atari joystick socket which allows for a tight fit while preventing accidental disconnection. The power supply does, though, take up space on a desk or table top and makes for one more thing that has to be transported if you move the computer.

Now let's look at the actual operation of the Dragon.

The Dragon is a 64K computer, as is Radio Shack's new 64K CoCo. However, the Dragon allows the user to access a 48K memory from BASIC without loading in a machine language program to access the upper 32K.

A quick check of memory with a *PRINT MEM* command will show a *PCLEAR4* memory of approximately 24K, just like the 32K and 64K CoCo. However, by typing *EXEC* and hitting [ENTER], the Dragon gets a super-memory charge and the available memory in BASIC is boosted to a whopping 48K. This is done by moving the ROM to the top of RAM. What is most amazing about this memory boost is that it does not destroy the program which may be resident in memory at the time, making it much like a *PCLEAR* command. All Extended BASIC commands remain intact, although some machine language programs would have to be rewritten to work in this memory. Also, the Dragon includes the new *PCLEAR* fix which avoids ?SN Errors after executing the *PCLEAR* command.

Screen layout and language commands remain virtually identical to the Color Computer. Some ROM calls are significantly different, although the alternate memory PEEK of 339 for joysticks appears to work on both computers. The BASIC tokens for the CoCo and the Dragon are very different, however, which means that programs saved on one will not load into the other unless they have been saved in ASCII. (While this technique is slow, it does allow communication between the two computers.) All programming tests which I conducted involved BASIC programs, and while I did not try any machine language programs, it is my understanding that these will be available almost immediately since the most popular programs have already been translated for the British market.

The unit, which sells for $399 comes packaged in a shock-resistant styrofoam packing. Included are the external power supply, the TV selector switch box, the TV connecting cable (RCA to RCA plug), and best of all, the cassette cable required to connect your Dragon to a standard cassette recorder. (Radio Shack's computer cassette recorder works nicely, as do a number of the moderately priced units.)

Also included is a thinnish 5" x 7" spiral bound tutorial book entitled "An Introduction to BASIC Programming Using the Dragon" by Richard Wadman. It appears that this handbook was written for the British market since most units are referred to in British pounds. The book covers the commands, but does not have the cartoon approach or the step-by-step learning lessons that Radio Shack's "Getting Started With Color BASIC" has. It appears to be easy reading for a fifth or sixth grader. The size of the handbook makes for easy reference and the inside cover includes an eight-fold Dragon Quick Reference Guide which can be removed for easy referencing.

In summary, I am hard-pressed to find fault with this offering from the Tano people. The only immediate drawback would appear to be the present lack of a disk system. However, this has been promised for the very near future and is not too great a shortcoming.

My Dragon has earned a permanent place next to my trusty Color Computer. (To be perfectly honest, my home unit is a TDP-100 while my classroom units are CoCos and MC-10s.) I can recommend it for serious consideration by both those who are looking for a first computer and those CoCo loyalists who want a second unit for any number of reasons.

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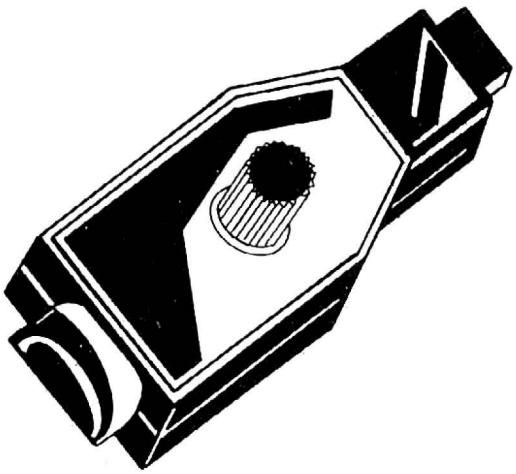
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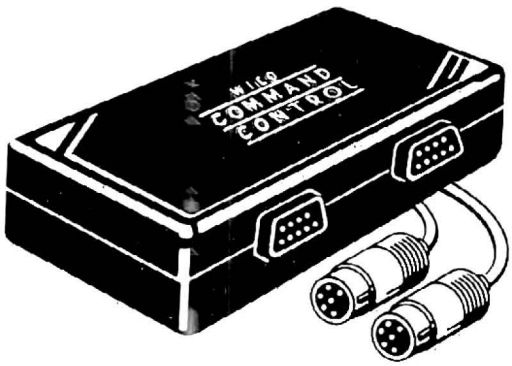
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PIPELINE

WITH CHRISTMAS COMING and all the cash outlay that portends, Radio Shack has introduced a rather timely program. It's called *Cash Budget Management*, and can turn CoCo into a sophisticated personal (or small business) bookkeeping and budgeting system. If you enter income and expense amounts on a regular basis, it'll be easy to track what money (what money?) you spent where for up to a year. The first item you might want to enter is the $49.95 amount that Radio Shack is asking for this neat little system.

* * *

SOMETHING ELSE we think is pretty slick isn't exactly news, since Radio Shack introduced it in August, but since we haven't mentioned it before in Pipeline, it's possible you missed the announcement. Besides, a major peripheral for $99.95 sounds like a potential Christmas gift. What is it? It's the TP-10 Thermal Printer, which not only can be used with the Color Computer, but seems ideal for the MC-10. We don't have one at *the Rainbow* yet, but Radio Shack says it's "whisper quiet," and prints 32 characters per line at 30 characters per second on 4-⅛" wide paper. It also can print 95 ASCII characters and 16 in block graphics compatible with the screen graphics produced by the MC-10. At 3" x 5" X 8" it might even fit into somebody's stocking.

* * *

WHERE THERE'S A WILL, there's a way, we once said, and for those of you who have unsuccessfully tried every way you can think of to get your tractor-feed printer to operate using ordinary sheets of stationery, Paper Tractor Ltd. of Goleta, California, has come up with a way so that your printer will. The Paper Tractor is a strip of pliable plastic sheeting with perforated edges and sleeves to carry regular paper sheets through the printer. For more information on this clever innovation, you can write to them at One South Fairview, Unit C, Goleta, CA 93117.

* * *

ONE WAY TO UPGRADE the educational potential of computers in the schools is to make software more affordable. Toward this end, Bertamax, Inc. seems to have taken a giant step with a new offer now underway. Entering a special licensing agreement with Bertamax, schools can reap genuinely hefty savings on the acquisition of all sorts of educational software for a number of different computers, including, of course, our own CoCo. They advertise access to 250 different software programs for a first-year license fee of $500. At that rate, our arithmetic shows a potential cost of $2 a program—the cost of some blank tapes! There are some stipulations involved, such as participation of a minimum number of schools within a given district, so we suggest that those interested contact the Bertamax folks at 3647 Stone Way North, Seattle, WA 98103. We're sure they'll be glad to send you a catalog along with the other information you'll want to have in hand when approaching your school's district office.

* * *

UNCLE SAMSOFT is not really the company's name, but "the idea whose time has come" seems to conjure that corporate image. The quote is from Gerald Carmen, head of the General Services Administration, and all the "to do" is about the grand opening of Office Technology Plus, the first privately-owned microcomputer and software retail store for the Federal Government. We're told that numerous members of Congress, other Federal officials and executives of a lot of national computer firms were on hand for the opening of the store, which is in the GSA's central headquarters.

Orders to date have included sales to the departments of Interior, Treasury, Transportation and the Navy, the White House, the Executive Office of the President, the Senate and the FBI. Right now, we're wondering two things: will the name "Office Technology Plus" fall to the tri-letteral acronymese of Washington shortspeak to be known as the OTP? And, will much of the software it sells be offered on red tape? Hmmm . . .

* * *

SPEAKING OF ACRONYMS, we're not sure if this is one or just a hard-to-pronounce word, but either way, CMJ-IF seems to be a distinctive new product for the Color Computer. Our information says that this multi-function subsystem plugs into the ROM port and provides a variety of enhancements to your computer, including a speech synthesizer that can virtually say any word in the language of your choice (we suspect you'll need to know the language), and an extender port which will allow you to access a disk controller or ROM pack without having to disconnect the CMJ-IF. It also comes with parallel ports, allowing you to hook up to a parallel printer, and it has real time clock capabilities for timing and counting functions.

It's available from Magnum Distributors Inc. 1000 S. Dixie Highway W #3, Pampano Beach, FL 33060, and they have it priced somewhere under $200. You can probably get them to narrow this down to an exact figure if you contact them. We would like to try its speech synthesizer out on its name. That would be a pretty good test — *Cumujif?*

* * *

LORD BYRON'S DAUGHTER (did you know?) was a mathematical genius who developed the prototype of the *GOTO* statement while helping Charles Babbage raise funds for his Analytical Engine. How's that for a scoop? Actually, this rather arcane tidbit of computer history appears with numerous other astonishing or maybe just plain interesting—computer facts in the new 1984 Computer Desk Diary published by Workman Publishing, of New York.

It's a nicely created, spiral-bound appointment calendar that has loads of color and black and white photographs and drawings to go with the computer-related text. There are charts and tables and quick reference guides, too. The cost is $8.95 and you can contact the publisher at 1 West 39 Street in New York City. The Zip is 10018.

Totally computeresed by Gil Roeder and Jason Shulman, you'll find it easily interfaces with pen or pencil.

* * *

NEW SOFT WEAR available in time for Christmas is the Computer Tie from Tie-One-On of Philadelphia (P.O. Box 40225). It has computer terms woven into stripes. As far as we know, it doesn't come in a string variable.

* * *

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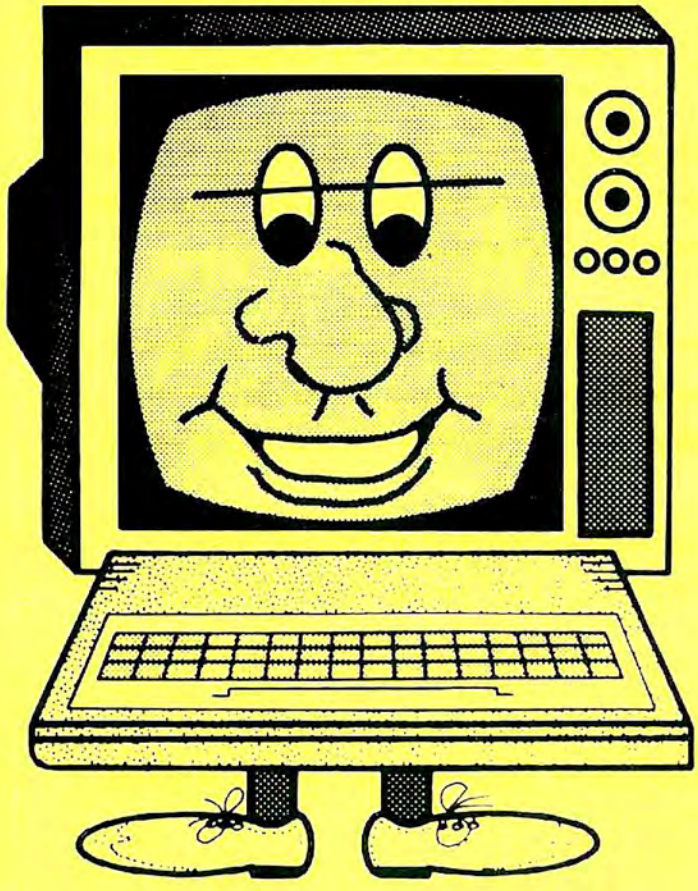
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A FACE-SAVING ADDRESSOR FOR FRED

By Don Hughes and Jessie James



A friend of ours named Fred has one of the best CoCo set-ups we've seen. It's a 64K machine with two drives, a neat printer, and a 13-inch TV set he bought just to use with his computer!

Fred spends many happy hours at his upgraded keyboard.

Fred's collection of programs is just out of this world. It's a program reviewer's dream come true. Each month he rips through the pages of *the Rainbow,* checking out the ads, to see if there is something new he can acquire.

But something strange happened to Fred just last week. He was sitting at his keyboard with a big smile on his face, when his wife came into his study and said, "Honey, I have a little job for you. Will you address a few of these bill envelopes for me so I can get them off in the mail?"

Fred's eyes lit up. At last he would prove to his wife that his CoCo was more than a mere toy; more than a simple game machine. He would deftly sail through the task and triumphantly deliver the goods in record time!

(Don Hughes, a writer and consultant, holds two master's degrees, one in education and the other in counseling. Jessie James has been engaged for the past 10 years in the electronic repair field. He is a bio-medical equipment technician at Kaiser Foundation Hospital in Fortana, Calif.)

To prove himself, all Fred had to do was address three envelopes including his return address. First, he looked into his vast arsenal of software. As his weapon, he chose his famous *Super Deluxe II* mail merge program, loaded it up, and swiftly scanned the main menu.

"Oh, oh," said Fred as he stroked his beard. "This program is great for custom letters and putting the addressee's name and address on the envelope, but I can't get my return address up in the corner."

Fred then decided to go for the heavyweight program, his *Super Hotdog 64 Wordblender.* He briskly keyed-in the information required on the envelopes, but suddenly found himself faced with a problem. He couldn't format the text so it would hit the envelope in the correct positions.

Fred recounted to us later that he thought maybe he was using too much of a heavy-duty program with the "Wordblender," so he decided to lighten-up and use his simple, but costly, screen format program.

About this time, his wife entered the room. She said, "Honey, are my three envelopes addressed yet?"

Fred had that big grin on his face again. He stuffed the first envelope into his printer and said, "Watch this." He started looking for the print key, but couldn't find it. He quickly checked the thick volume of documentation, but was chagrined to find that the particular edition of the

program he owned did not have a printer output routine.

Fred was thinking how he could get his wife to leave the room for a few minutes as he clandestinely eyed her typewriter in the corner of the room.

How could Fred save face? How could he justify buying more hardware and software when, with all his fancy stuff, he couldn't get the addresses on three envelopes?

If Fred had had a copy of the simple program below, he could have saved the day. This program turns your CoCo into a typewriter, so all you have to do is type in your name and address, and the name and address of the person you're mailing the letter to, and . , . presto, a simple job is handled in an easy manner.

```
170.....01BF
END ...02D8
```

The listing:

```
10 ' ENVELOPE ADDRESSOR
20 ' BY JESSIE JAMES
30 ' AND DON HUGHES
40 ' (C) 1983 BY JESSIE JAMES
50 ' AND DON HUGHES
60 'THIS PROGRAM IS FOR LEGAL-
70 'SIZED ENVELOPES. TO USE
80 'WITH LETTER-SIZED CHANGE
90 'THE VALUE OF "S" IN LINE
100 '100 TO S=25.
110 CLS
120 POKE 150,18
130 PRINT@37,"ENVELOPE ADDRESSOR
":PRINT@97,"from:";
140 S=0:GOSUB 200
150 S=33:FOR X=1 TO 5:PRINT#-2,"
":NEXT X
160 CLS:PRINT@64,STRING$(32,195)
;
170 PRINT@37,"ENVELOPE ADDRESSOR
":PRINT@97,"  to:";
180 GOSUB 200
190 RUN
200 PRINT@64, STRING$(32,195);
210 FOR X=1 TO 4
220 PRINT@ X*32+133,"*";
230 LINE INPUT A$(X)
240 NEXT X
245 IF S=0 THEN PRINT@385,"posit
ion envelope in printer    press
 <ENTER> when ready";:INPUT C$
250 FOR X= 1 TO 4
260 PRINT#-2, STRING$(S," ");A$(
X)
270 NEXT X
280 IF S=0 THEN RETURN
290 FOR X= 1 TO 10
300 PRINT#-2
310 NEXT X
320 RETURN
```


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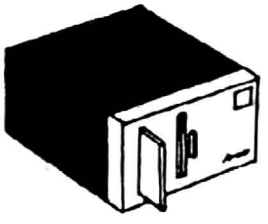
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KEEPING TRACK WITH *QUICK FIND*

By Paul Selig

This program is for the disk user who has accumulated so many programs it has become impossible to know where they all are. You can, of course, put each disk in the drive and do a *DIR* to get the directory for each disk, but to go through this for twenty or thirty disks can be a bit time consuming. This program, *Quick-Find Directory,* will produce an alphabetical listing of the contents of up to 10 disks. To aid in the reading of the listing, the format will be three columns by 55 lines. The advantage to this format is that all you must do is read down the columns to find your program instead of across, which is more time-consuming when you have a large list.

The program itself is very straight-forward, in a pseudo-structure format (the program goes from beginning to the end). The first few lines will print the heading on the screen and initialize the variables that are used in the program. The program will then proceed to ask you to put the disk in the drive and enter its number. After the number has been entered, the program will read the directory from the disk and add it to the array P$. After you type the word "END" or 10 disks have been read, the program will continue on and sort the array P$. The sort which this program uses is commonly known as a "shell" sort. I chose to put this sort in this program because it is well-suited for sorting a small number of elements (about 200-300), but will slow considerably when you get above 500 items. In this program, 250 items take about three minutes, while the maximum number of items, 680 (68 grans * 10), takes about an hour and a half.

This program uses some special codes to control the printer, as are commented in the listing. These codes are used for an Okidata 82A printer. If you have another printer, you will have to modify these CHR$ codes appropriately. If you are not using an eighty column printer, you must modify the print routine to work with it. This program also assumes a page length of 66 lines, and if your printer is different the program must be modified.

(Paul Selig, Jr. is a junior in high school and president of the Westshore TRS-80 Users Group and the Cleveland CoConuts. He is also the sysop of the Westshore TRS-80 Users Group Bulletin Board System which can be reached at (216) 333-0574, 24 hours a day.)

When you use this program, it will prompt you for the disk number. Place the disk in the drive and enter the number. In my disk library, I use a three-number coding technique. The first number is the *volume* number, and the second and third represent the number of the disk. For example, disk 412 is a disk from volume 4, disk number 12. Of course, you can use any format you like, including just the plain disk number. After the disk directory has been read, the program will prompt you to place the next one in the drive. One precaution I must mention is that if your disks have many filenames in the directory, the disk may stop and the computer will process the information, and then will continue to read from the disk. In other words, DO NOT remove the disk from the drive until you hear the tone from the speaker, or else you might cause an error and you will have to start over. Also, if you read 10 disks, the program will print the message "10 DISKS READ" and move on to the sort routine. You can play around with this value, but remember it is set to read 10 disks of 68 files each (very unlikely).

One thing which might interest some of you is the way in which I achieved the three-column printout. Since I know that there are 55 lines to be printed (not counting the header), and there are three columns, there will be a total of 165 filenames on each page. If there are more than 165 filenames to be printed, the computer will do a form-feed and the next page will be printed. However, to keep things neat, the sort program will put all the null strings at the end of the list, so that when you print out, the columns will go down until there are no more items, and the rest of that column will be blank. It is hard to explain, so you should really try it for yourself. The printing is done by keeping track of what page you are on, and by setting it to zero for the first page, one for the second, etc., and multiplying this number by 165, you will be able to print out all of the filenames using one *FOR-NEXT* loop.

```
230.....0291
460.....04A4
END.....0755
```

The listing:

```
10 'QUICK-REFERENCE DIRECTORY
20 ' BY: PAUL SELIG, JR.
```

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```
30 '
40 ' INITIALIZE
50 'VARIABLE LIST
60 ' PC=# OF FILENAMES READ
70 ' P1$=FILENAME WITHOUT DISK #
80 ' Z$=CURRENT DISK #
90 ' PP$=TEMPORARY STORAGE
100 ' P=CURRENT PAGE
110 ' TC=NUMBER OF DISKS READ
120 PCLEAR1:CLEAR18000:DIMP$(736
):PC=0:TC=0
130 CLS:PRINTSTRING$(32,172);CHR
$(128);"  QUICK REFERENCE DIRECT
ORY    ";CHR$(128);STRING$(32,163
);
140 PRINTSTRING$(64,128)
150 IF TC=10 THEN PRINT"10 DISKS
 READ!":FORX=1TO1000:NEXTX:GOTO3
60
160 SOUND1,1:LINEINPUT"MOUNT DIS
K IN DRIVE '0' & ENTER THE DISK
NUMBER:  ";Z$
170 TC=TC+1
180 IFZ$="END" THEN 360
190 'READ IN THE DIRECTORY
200 FORS=3TO11
210 DSKI$0,17,S,A$,B$
220 FORX=1TO128 STEP 32
230 P1$=MID$(A$,X,12):GOSUB300
240 NEXTX
250 FORX=1TO128 STEP 32
260 P1$=MID$(B$,X,12):GOSUB300
270 NEXTX
280 NEXTS
290 GOTO150
300 IFLEFT$(P1$,1)=CHR$(255)THEN
 150
310 IFLEFT$(P1$,1)=CHR$(0)THENRE
TURN
320 P1$=LEFT$(P1$,8)+"."+MID$(P1
$,9,12)+"   "+Z$
330 P$(PC)=P1$:PC=PC+1
340 RETURN
350 'SORT THE ARRAY P$()
360 CLS0:B=1
370 B=2*B:IFB<=(PC-1) THEN 370
380 B=INT(B/2):IFB=0THEN450
390 FORI=1TO(PC-1)-B:C=I
400 'NOTE: ENTER lowercase USING
     THE SHIFT-0!!
410 D=C+B:IFP$(C)<=P$(D)THEN440
420 PRINT@0,"sorting";
430 PP$=P$(C):P$(C)=P$(D):P$(D)=
PP$:C=C-B:IFC>0THEN410
440 NEXTI:GOTO380
450 SOUND1,20:CLS0
460 PRINT@0,"sort";CHR$(128);"co
mplete";:FORX=1TO1000:NEXTX
470 CLS:PRINT"BE SURE PRINTER IS
 CONNECTED,   SELECTED, AND TURN
ED ON. WHEN   READY, HIT THE [EN
TER] KEY":PRINT:PRINT
480 LINEINPUTA$
490 CLS0:PRINT@0,"printing";
500 FORP=0 TO 4
510 'CHR$(31) IS THE EXPANDED
     PRINT (40 CHARS/LINE) MODE
520 'CHR$(30) IS THE RETURN TO
     NORMAL CODE
530 PRINT#-2,CHR$(31)TAB(12)"QUI
CK-FIND DIRECTORY"CHR$(30)
540 PRINT#-2,""
550 PRINT#-2,"FILENAME.EXT  DISK
"TAB(31)"FILENAME.EXT  DISK"TAB(
62)"FILENAME.EXT  DISK"
560 PRINT#-2,"------------  ----
"TAB(31)"------------  ----"TAB(
62)"------------  ----"
570 'PRINT THE DATA IN A THREE
     COLUMN FORMAT
580 FORX=0+(P*165) TO 54+(P*165)
590 PRINT#-2,P$(X),P$(X+55),P$(X
+110)
600 IF PC<X THEN RUN
610 NEXTX
620 'CHR$(12) IS THE FORM FEED
     CHARACTER
630 PRINT#-2,CHR$(12)
640 NEXTP
```


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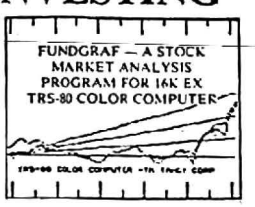
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Putting A Little History In Your Future

By Michael Plog, Ph.D.
Rainbow Contributing Editor

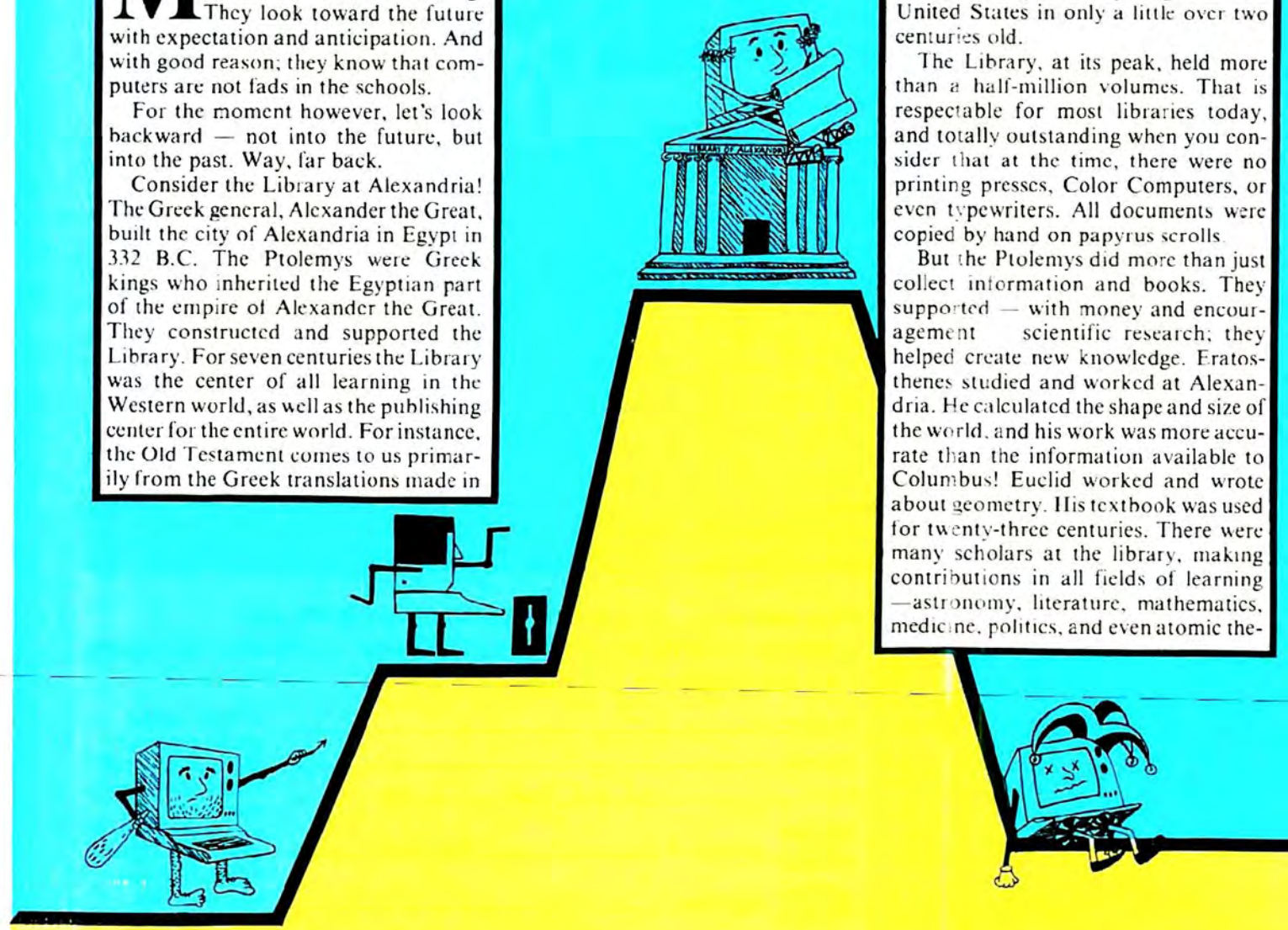
Most people involved with education are forward looking. They look toward the future with expectation and anticipation. And with good reason; they know that computers are not fads in the schools.

For the moment however, let's look backward — not into the future, but into the past. Way, far back.

Consider the Library at Alexandria! The Greek general, Alexander the Great, built the city of Alexandria in Egypt in 332 B.C. The Ptolemys were Greek kings who inherited the Egyptian part of the empire of Alexander the Great. They constructed and supported the Library. For seven centuries the Library was the center of all learning in the Western world, as well as the publishing center for the entire world. For instance, the Old Testament comes to us primarily from the Greek translations made in the Alexandrian Library. Seven centuries, by the way, is a very long time. The United States in only a little over two centuries old.

The Library, at its peak, held more than a half-million volumes. That is respectable for most libraries today, and totally outstanding when you consider that at the time, there were no printing presses, Color Computers, or even typewriters. All documents were copied by hand on papyrus scrolls.

But the Ptolemys did more than just collect information and books. They supported — with money and encouragement — scientific research; they helped create new knowledge. Eratosthenes studied and worked at Alexandria. He calculated the shape and size of the world, and his work was more accurate than the information available to Columbus! Euclid worked and wrote about geometry. His textbook was used for twenty-three centuries. There were many scholars at the library, making contributions in all fields of learning —astronomy, literature, mathematics, medicine, politics, and even atomic the-

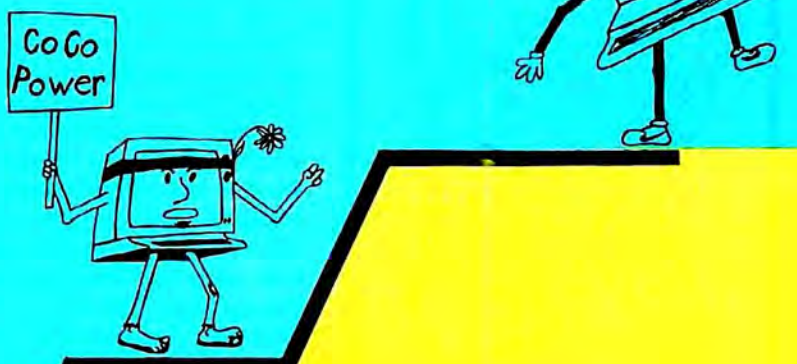


ory that led to the study of electrons and the eventual development of the computer.

Today, nothing of the great Library but third-hand writings exist. The Library was destroyed in 415 A.D. I do not know all the reasons for the destruction. My thoughts and theories on the topic are unimportant. Just consider the Library as a symbol of learning for the ancient world.

The period from about 500 A.D. to the Renaissance (about 1500 A.D.) is known as the "Dark Ages." And with good reason. Science, technology, and learning in general stagnated during this time. Living conditions were poorer in Europe than existed centuries before in Greece and Egypt. Superstition, not science, ruled in Europe, for the elite as well as for the less affluent. The advancement of the human race was halted.

It is incorrect, of course, to blame the entire Dark Ages on the myopia of those people who fought against the Library of Alexandria. Conditions were





many years in the making, and the fall of the Library was only one (although major) step in the supression of ideas. Those aborted ideas could have hastened the advancement of civilization. Just think—without the stupidity of European leaders during this time, we could have had our Color Computer a millienum earlier!

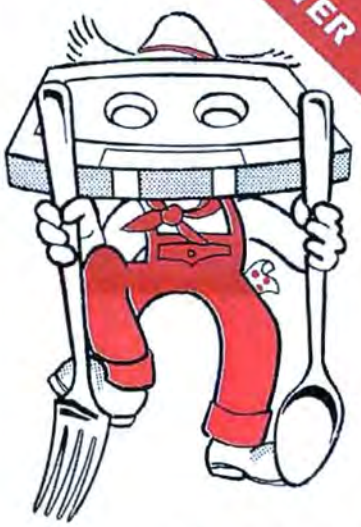
Come back to the present with me now. The excursion into the past may be interesting, but of what value is such a consideration for today?

It is entirely possible that the world, or at least our part of it, could be forced into another Dark Ages. Only the next one may last longer than just 1000 years. I cannot name the minds of those who would conspire for the death of free ideas. I do not know whose hands would tie the strangulation knot on inquiry. I do, however, know what the rope would look like. The last step in the creation of our next Dark Ages would be the forceful resistance to, and suppression of, exchange of information.

This is where the computer comes in. The computer can be—indeed should be—a tool to fight suppression, to be used for expansion and sharing of ideas. People use computers to write and store information about work they are doing, new ideas, new techniques they are developing. In many scientific fields of inquiry, advancement of knowledge has been increased dramatically because of the assistance provided by the computer.

(Michael Plog received his Ph. D. degree from the University of Illinois, the M.S. from Memphis State University, and the B.S. from the University of Tennessee. For his foreign/research language option required for the doctorate, he naturally selected computer language. Michael currently works for the Illinois State Board of Education as a research and evaluation specialist.)

TRS-80 COLOR COMPUTER



TOOLS

Programs that make it easy to exploit the power and beauty of your Color Computer without making it hard on your wallet:

Graphics #1 - Displays and text delightfully manipulated! Watch and use First Cover, Drawer (the best drawing program anywhere), Graphtext (puts text on the graphics screen), Smalltext, Rotate (create and spin 3D objects in real time), World Map, 3D World, Star Map, String Art, Kaleidoscope, and Display Demo (text screen wizardry)!

Utilities #1 - Programming is simpler when you use Lister, Listmod, Newtrace (a better TRON), Lazkey (define keys as phrases), Append (easily combine two BASIC programs), BASIC Map, Varmap, Deleter, and CK Monitor (look at and modify memory).

Disk Utilities #1 - Harness the hidden powers of your disk system with Disk Edit (change things on disk directly), Disk Aid, Offset (EXECs most tape-only programs), Track Lock, DIR Save/Get (foil I/O errors), Cataloger, Master Catalog (keep track of your program library), and File Copy (a better BACKUP).

Choose any one of the three packages for just $12.00 ($17.00 on disk)!

SILVERWARE

- a lot of software for a little silver

See your dealer or:
Write or call us direct at P.O. Box 21101, Santa Barbara CA 93121 (805) 966-1449

As with any tool, negative applications are as possible as positive. Mainframe computers have been used to violate rights of privacy and restrict communication. It is easy for those in charge of the large data bases on mainframes to subvert the law and use the massive amounts of information for less than noble purposes.

Ah, now enter the microcomputer. This technology means that the number of people having access to information is suddenly increased by factors never dreamed of in older times. Information is now available to multitudes, not just the elite and political leaders. Outside of science fiction literature and some futurists writings, this explosion of information users was undreamed of just a few decades ago. You can sit in your home, with your inexpensive Color Computer, and make contact through a modem with people all over the country. You can purchase software for your Color Computer on almost any field you want. Just glance through the advertisements and articles in this issue of *the Rainbow*, and see how many tapes of topics you can learn about.

The microcomputer is not the cause of our present ability to learn about anything we wish; it is, however, the means to help us in our individual pursuit of learning about things of personal interest.

One other point should be made about the Library at Alexandria. The information stored and produced there was never shared outside a small, priviledged group of people. The information was never popularized to improve working and living conditions. In fact, information was considered dangerous in the wrong hands.

One of the products of the evolution of the American educational system is the concept of universal literacy. One of the outcomes of microcomputer technology is the ability for a single individual to collect and store large amounts of knowledge with little cost. Because of the power for the price, I prefer the Color Computer over any other; I assume you share this opinion, because you are reading this particular magazine.

This means that every home with a microcomputer can have their own slice of a library as great as the Library at Alexandria. The Dark Ages may not come after all. Your responsibility is to keep learning—education should never end with schooling.

Radio Shack Color Computer TDP System 100



ROAR!

Do tricks with your computer without breaking your wallet's spirit! A subscription to **Chromasette** gets you a tape or disk full of quality programs delivered by First Class Mail every month! Write for more information or, better yet, try a Back Issue. At $6.00 for 6 to 8 programs on tape ($11.00 on disk), you'll see just how good and inexpensive **Chromasette** software is.

The Bottom Line:	Tape	Disk
1 year (12 issues)	$50.00	$95.00
6 months (6 issues)	$30.00	$55.00
Single issues	$ 6.00	$11.00

Calif. residents add 6% to single issues. First Class postage to N. Amer. included. Overseas add $10 to subscriptions and $1 to single issues. Sent AO rate. All back issues from July 1981 available—ask for list. Programs are for the Extended BASIC model and occasionally for disks.



Chromasette

P.O. Box 1087 Santa Barbara, CA 93102
(805) 963-1066

A Super-Organizer For Your Tape Files

By Richard T. Meuse

There are many good tape directory programs available today. Some do this and some do that, but I was in need of a directory that was flexible. I wanted one that could be added to as the programs came along. One that would not change in size as programs were added or changed. One that would automatically load the program so you didn't have to stay with the computer until it loaded. I came up with the following program after several attempts. After trying it out with many friends in our local users group, I decided to share it with you.

As the program is shown, in lines 160 thru 250, the (1)XXXXXXXX will be replaced by the name of the program you will have as the first program after *TAPE—DIR* on your cassette. If the name of any of your programs are not eight characters long, still use all of the Xs, substitute SPACES for the Xs not used; that is, if your first program is named "DIZZY" let's say, you would replace the Xs like so. (1)DIZZY , note three blank spaces after the Y in DIZZY. You would also have to change the Xs in line 390 to: CLOAD "DIZZY "

The reason for the spaces is to keep the program length the same no matter when you add a new program to the tape. There are advantages to having 10 programs all ready to program into the directory. The main one is being able to load the shorter programs first, thus saving time when loading into the computer, by not having to waste time going by the longer programs just to get to the shorter ones. It is easier to *CSAVE* programs in groups rather than one at a time, because you have to *SKIPF* past the last program on the tape in order to position the tape for the program you are now going to *CSAVE*.

The program lines up this way:

100-140 — Clears screen, paints border
150-270 — Prints Menu & Instructions
280-380 — Looks for proper selection entered.
390-480 — Acknowledges selection, *CLOADs* program
490-540 — *GOSUB* routine.
550 *GOSUB* for 390 to 480

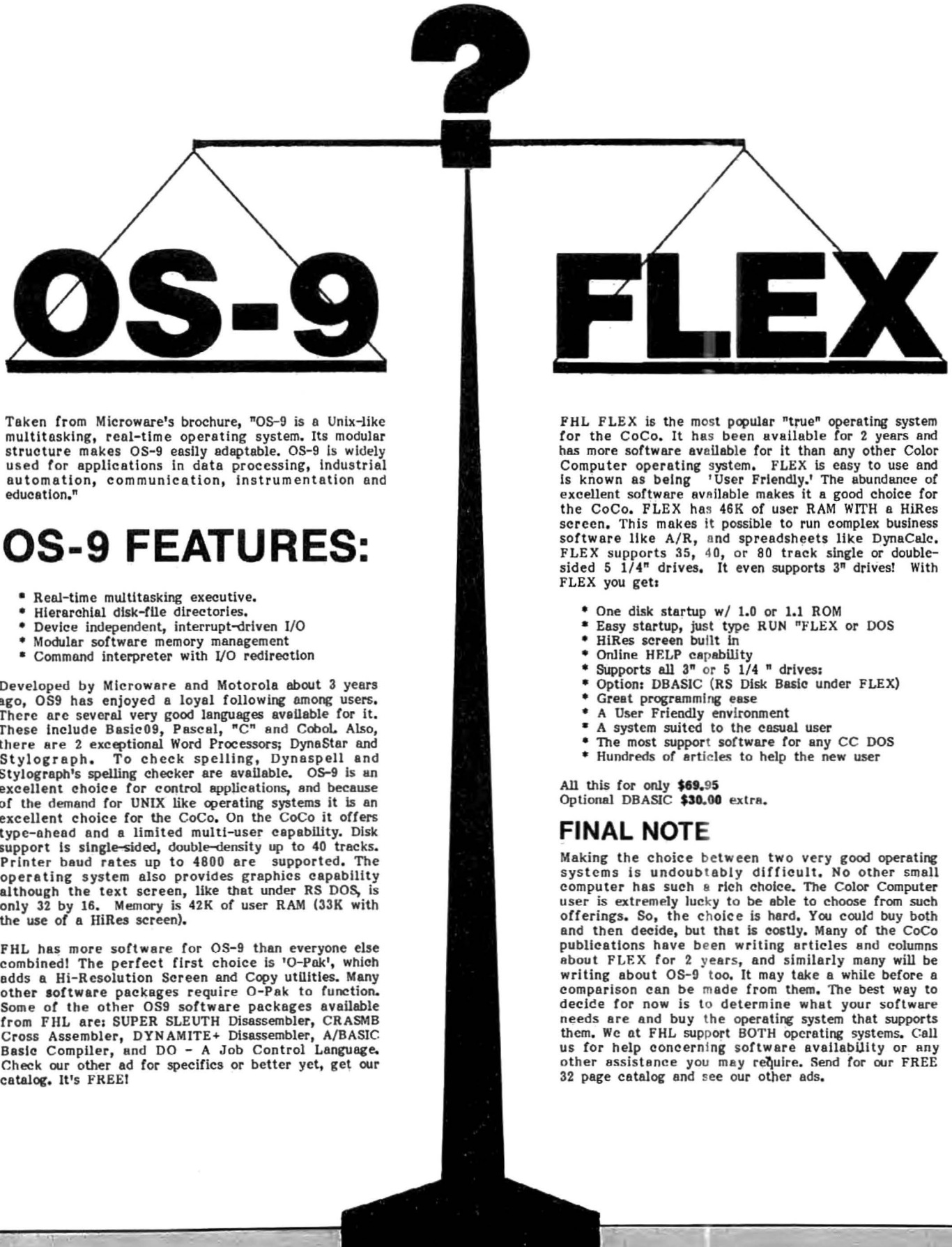
(Richard Meuse, who was forced into a disability retirement, is a self-educated electronic design engineer. His interests include computer electronics and programming, especially in the educational and utility area. When he's not at his keyboard, he spends time on the amateur band as N1CMO, talking about his CoCo, of course.)

```
150.... 013D
260....02DD
380.....0403
480.... 05A7
END... 067F
```

The listing:

```
10 '****TAPE DIRECTORY****6/83
20 '
30 '
40 'BY: RICHARD T. MEUSE
50 '     125 LEBANON ST.
60 '     MELROSE, MA. 02176
70 '     (617)665-6061
80 '
90 '
100 GOSUB 490
110 FORX=1061TO1082:POKEX,255:NE
XT
120 FORX=1061TO1413STEP32:POKEX,
255:NEXT
130 FORX=1413TO1434:POKEX,255:NE
XT
140 FORX=1434TO1082STEP-32:POKEX
,255:NEXT
150 PRINT@9,"TAPE DIRECTORY";
160 PRINT@32*2+6," *    (1)XXXXXX
XX    ";
170 PRINT@32*3+6,"<P>   (2)XXXXXX
XX    ";
180 PRINT@32*4+6,"<R>   (3)XXXXXX
XX    ";
190 PRINT@32*5+6,"<O>   (4)XXXXXX
XX    ";
200 PRINT@32*6+6,"<G>   (5)XXXXXX
XX    ";
```

WHICH "WEIGH" TO GO?



Taken from Microware's brochure, "OS-9 is a Unix-like multitasking, real-time operating system. Its modular structure makes OS-9 easily adaptable. OS-9 is widely used for applications in data processing, industrial automation, communication, instrumentation and education."

OS-9 FEATURES:

- Real-time multitasking executive.
- Hierarchial disk-file directories.
- Device independent, interrupt-driven I/O
- Modular software memory management
- Command interpreter with I/O redirection

Developed by Microware and Motorola about 3 years ago, OS9 has enjoyed a loyal following among users. There are several very good languages available for it. These include Basic09, Pascal, "C" and Cobol. Also, there are 2 exceptional Word Processors; DynaStar and Stylograph. To check spelling, Dynaspell and Stylograph's spelling checker are available. OS-9 is an excellent choice for control applications, and because of the demand for UNIX like operating systems it is an excellent choice for the CoCo. On the CoCo it offers type-ahead and a limited multi-user capability. Disk support is single-sided, double-density up to 40 tracks. Printer baud rates up to 4800 are supported. The operating system also provides graphics capability although the text screen, like that under RS DOS, is only 32 by 16. Memory is 42K of user RAM (33K with the use of a HiRes screen).

FHL has more software for OS-9 than everyone else combined! The perfect first choice is 'O-Pak', which adds a Hi-Resolution Screen and Copy utilities. Many other software packages require O-Pak to function. Some of the other OS9 software packages available from FHL are: SUPER SLEUTH Disassembler, CRASMB Cross Assembler, DYNAMITE+ Disassembler, A/BASIC Basic Compiler, and DO - A Job Control Language. Check our other ad for specifics or better yet, get our catalog. It's FREE!

FHL FLEX is the most popular "true" operating system for the CoCo. It has been available for 2 years and has more software available for it than any other Color Computer operating system. FLEX is easy to use and is known as being 'User Friendly.' The abundance of excellent software available makes it a good choice for the CoCo. FLEX has 46K of user RAM WITH a HiRes screen. This makes it possible to run complex business software like A/R, and spreadsheets like DynaCalc. FLEX supports 35, 40, or 80 track single or double-sided 5 1/4" drives. It even supports 3" drives! With FLEX you get:

- One disk startup w/ 1.0 or 1.1 ROM
- Easy startup, just type RUN "FLEX or DOS
- HiRes screen built in
- Online HELP capability
- Supports all 3" or 5 1/4 " drives:
- Option: DBASIC (RS Disk Basic under FLEX)
- Great programming ease
- A User Friendly environment
- A system suited to the casual user
- The most support software for any CC DOS
- Hundreds of articles to help the new user

All this for only **$69.95**
Optional DBASIC **$30.00** extra.

FINAL NOTE

Making the choice between two very good operating systems is undoubtably difficult. No other small computer has such a rich choice. The Color Computer user is extremely lucky to be able to choose from such offerings. So, the choice is hard. You could buy both and then decide, but that is costly. Many of the CoCo publications have been writing articles and columns about FLEX for 2 years, and similarly many will be writing about OS-9 too. It may take a while before a comparison can be made from them. The best way to decide for now is to determine what your software needs are and buy the operating system that supports them. We at FHL support BOTH operating systems. Call us for help concerning software availability or any other assistance you may require. Send for our FREE 32 page catalog and see our other ads.

FHL Color FLEX

FLEX is the disk operating system you need to run all this software and more on your 64K Color Computer! A single-user system designed to be very powerful yet very easy to learn to use. FLEX features dynamic filespace allocation, random and sequential file accessing, batch job type program entry, user startup facility, automatic drive searching, file dating, space compression, complete user environment control, English error messages, smooth scrolling and much more!

INCLUDES:

* EASY STARTUP
* ONLINE "HELP" CAPABILITY
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All this for only **$89.95!**

LANGUAGES

DBASIC

Radio Shack 1.0 Disk Basic adapted to work with FHL Color FLEX: **$30.00**

TSC Extended BASIC

TSC XBASIC for CoCo FLEX: **$100.00**

TSC PASCAL

TSC PASCAL CoCo FLEX **$200.00**

A/BASIC COMPILER for OS9 and FLEX

Produce fast, compact, ROMable object code from easy to write BASIC source code.

CoCo FLEX or OS9 Object only: **$75.00**

DYNASOFT PASCAL for FLEX and OS9

This remarkable Pascal Subset is a p-code implementation that only requires 12K of RAM!

CoCo FLEX or OS9: **$59.95**

NEW! DYNA-C for FLEX and OS9

This new "C" subset runs circles around any others in its price class!

CoCo FLEX or OS9: **$59.95**

INTROL-C COMPILER for FLEX and OS9

A complete, efficient, fast C compiler which includes a Macro Relocating Assembler/Linking Loader, Runtime Library, and Library Manager.

CoCo FLEX or OS9 : **$375.00**

SOFTWARE DEVELOPMENT TOOLS

ED/ASM

Full feature line-oriented Editor and conditional macro Assembler.

CoCo FLEX version: **$69.95**

OSM

An Extended 6809 Macro Assembler

Generate OS9 or FLEX binary! **$99.00**

CRASMB Macro Cross Assembler

Use the Macro Cross-Assembler and any of the following CPU Personality Modules (CPM's) to assemble that CPU's Source code into OS9, FLEX, Motorola S1-S9 or INTEL-HEX formatted Object code files. Available CPM's: Motorola 6800-2-8, 6801-3, 6805, 6809, Mostek 6502, RCA 1802, INTEL 8080-5, ZILOG Z-80.

CoCo FLEX or OS9:

CRASMB Object only:	**$200.00**
CPM's Object only:	**$ 35.00 each**
CPM's with Source:	**$ 70.00 each**

* SPECIAL * Purchase CRASMB with all modules (Source included) for **$499.00**

SUPER SLEUTH

Examine and modify or disassemble binary program files into source code format. Object code for 6800, 01, 02, 03, 05, 08, 09, or 6502 may be processed.

Object only:

CoCo OS9:	**$49.95**
CoCo FLEX:	**$50.00**
RS DOS:	**$49.00**

DYNAMITE +

Easy to use disassembler complete with cross-reference generator, and label files maintained in text form only.

Object only.

CoCo FLEX:	**$100.00**
CoCo OS9:	**$150.00**

TSC DEBUG

Set up to 32 breakpoints. A must for anyone serious about Assembly Language programming!

CoCo FLEX version: **$75.00**

FHL FLEX Color Utilities

This combination of Toolkit #2 and Extended utilities for FLEX includes: REPAIR, SCAN, REPLACE, INIT, USERINFO, LOAD, SAVETEXT, READTEXT, DISKDUMP, LNKMAT, SEGMAT, MAP, AND DINFO.

Object only: **$50.00**
w/Source: **$75.00**

TSC FLEX UTILITIES

This set of FLEX utilities includes memory dump, prompting delete, extended directory display, binary program mapper and 13 more!

$75.00

TSC FLEX DIAGNOSTICS

Examine and repair your FLEX disks. Recover data from a disk with a damaged directory.

CoCo FLEX version: **$75.00**

APPLICATIONS SOFTWARE

DYNASTAR SCREEN EDITOR WORD PROCESSOR

This extremely powerful, menu-driven Word Processing system is composed of Dynastar, the Text Generator and Dynaform, the Text Formatter/Mail Merge program.

DYNASTAR: for FLEX or OS9:	**$ 90.00**
DYNAFORM: for FLEX or OS9:	**$ 90.00**
Purchased together:	**$175.00**

DYNASPELL Spelling Checker

Use with Dynastar or Stylograph for a complete word processing system. Now with new LOOKUP command!

CoCo FLEX or OS9 versions: **$59.95**

STYLOGRAPH

A complete word processing system which offers total formatting control.

CoCo FLEX:	**$149.95**
CoCo OS9:	**$149.95**

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The powerful electronic spreadsheet for 6809 computers!

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Five machine language programs that make up one of the most powerful business programming tools available.

CoCo FLEX and OS9 versions: **$200.00**

UDRI

UDRI SOFTWARE FOR FHL FLEX:

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* ACCOUNTS PAYABLE:			**$ 99.95**
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* INVENTORY 2:			**$ 69.00**

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PRO-COLOR-SERIES

PRO-COLOR-FILE *Enhanced* $79.95 D

This high level data base development program offers the ability to track any type of information. From Mailing Lists to Expense Records, to Inventory or Court Trials, PRO-COLOR-FILE has the versatility to handle it.

- 60 Data fields
- Upto 1020 Bytes per record
- Use 1-4 Disk Drives
- 4 Color Data Entry Screens
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- Scan File Alphabetically
- Duplicate records
- Duplicate fields
- 8 Report formats
- Summary Reports
- Screen Reports
- Page titles, numbering
- Sort on any Field
- Sort 3 Fields at once
- Sort any size file
- Select sub-sets of file

See Reviews in:

Color Computer News -- June 83
Hot CoCo -- August 83
Rainbow Magazine -- June 83

PRO-COLOR-FORMS ** NEW ** $39.95 D

Generate customized letters by merging PRO-COLOR-FILE data files with a letter. Print a personalized letter to everyone on your list. PRO-COLOR-FORMS will place data anywhere on a full page, even within the text of a letter.

- Embedded control codes
- 6 User designed forms
- 32 to 133 characters
- 7 to 66 lines

Have your data printed on pre-printed forms or design your own. Requires PRO-COLOR-FILE to use.

PRO-COLOR-DIR ** NEW ** $24.95 D

Compile a master listing of all your directories in one data file. This utility program will read a diskette's directory and place the information in one master file. PRO-COLOR-FILE is then used to generate reports or search and update. PRO-COLOR-DIR will store:

- Diskette ID name
- File name/Extension
- File type (Basic, ML, Data)
- Number of Sectors allocated
- ML Load and Execute address
- Date Created
- Date Updated
- Number of Grans allocated
- Number of Sectors used
- ML file length

Store 1000 entries! Requires PRO-COLOR-FILE to use.

See your local dealer or send check or money order to:
Derringer Software, P.O. Box 5300, Florence, SC 29502
Visa, MasterCard customers call (803) 665-5676 after 6 pm.
Add $2.00 for Shipping and Handling No C.O.D.'s

PRO-COLOR-FILE, PRO-COLOR-DIR,
PRO-COLOR-FORMS (C) 1983
Derringer Software
All programs require 32k Color Computer Disk System
(Does not require joysticks!)


```
210 PRINT@32*7+6,"<R>  (6)XXXXXX
XX    ";
220 PRINT@32*8+6,"<A>  (7)XXXXXX
XX    ";
230 PRINT@32*9+6,"<M>  (8)XXXXXX
XX    ";
240 PRINT@32*10+6,"<S>  (9)XXXXX
XXX    ";
250 PRINT@32*11+6," *   (0)XXXXX
XXX    ";
260 PRINT@32*13+3,"<<PRESS PLAY
ON RECORDER>>";
270 PRINT@32*14+1,"<<SELECT DESI
RED PROGRAM #  >>";:SOUND144,2
280 A$=INKEY$:IFA$=""THEN GOTO 2
80
290 IFA$="1" GOTO 390
300 IFA$="2" GOTO 400
310 IFA$="3" GOTO 410
320 IFA$="4" GOTO 420
330 IFA$="5" GOTO 430
340 IFA$="6" GOTO 440
350 IFA$="7" GOTO 450
360 IFA$="8" GOTO 460
370 IFA$="9" GOTO 470
380 IFA$="0" GOTO 480 ELSE 280
390 GOSUB 490:GOSUB550:CLOAD"XXX
XXXXX":'PROGRAM #1
400 GOSUB 490:GOSUB550:CLOAD"XXX
XXXXX":'PROGRAM #2
410 GOSUB 490:GOSUB550:CLOAD"XXX
XXXXX":'PROGRAM #3
420 GOSUB 490:GOSUB550:CLOAD"XXX
XXXXX":'PROGRAM #4
430 GOSUB 490:GOSUB550:CLOAD"XXX
XXXXX":'PROGRAM #5
440 GOSUB 490:GOSUB550:CLOAD"XXX
XXXXX":'PROGRAM #6
450 GOSUB 490:GOSUB550:CLOAD"XXX
XXXXX":'PROGRAM #7
460 GOSUB 490:GOSUB550:CLOAD"XXX
XXXXX":'PROGRAM #8
470 GOSUB 490:GOSUB550:CLOAD"XXX
XXXXX":'PROGRAM #9
480 GOSUB 490:GOSUB550:CLOAD"XXX
XXXXX":'PROGRAM #0
490 CLS0:SOUND201,2
500 FORX=1024TO1504STEP32:POKEX,
175:NEXT
510 FORX=1504TO1535:POKEX,175:NE
XT
520 FORX=1503TO1055STEP-32:POKEX
,175:NEXT
530 FORX=1024TO1055:POKEX,175:NE
XT
540 SOUND96,2:RETURN
550 PRINT@32*7+3,"PROGRAM #"A$"
IS NOW LOADING";:PRINT@32*9+10,"
PLEASE WAIT";:SOUND126,2:RETURN
```

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- The SPLC-1 is fully compatible with all TRS-80C
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- *Installation will void the Radio Shack warranty.*

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RAINBOW CERTIFICATION SEAL

L CINT

Lower case interpreter program allows input of lower case command words to be accepted. Also allows for one key pause features and single step through listings. With instructions and cassette, disk compatible. $10.95

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*64K RAM CHIPS

Eight 200 NS Factory Prime 64K RAM Chips. Allows you to upgrade "E" board easily. No soldering needed..... $69.95

NOTE: 64K upgrade will NOT provide 64K of user Ram, but allows later revision boards (E, ET) to run cooler and more efficiently.

**Installation of these items will void the Radio Shack warranty. Radio Shack is a trademark of the Tandy Corp.*

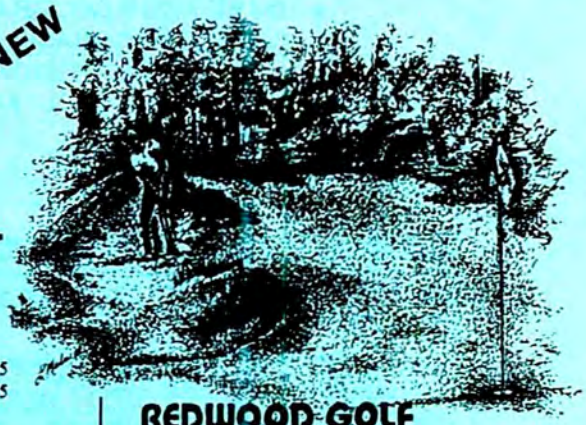
DATABASE / MAILER LETTER WRITER

by EVS

Tape version doesn't require EXT. Basic.
CC-DBM/CC-LW $49.95

All programs warrantied 60 days from date of purchase to original purchaser.

NEW



REDWOOD GOLF

by David C. Langyel

© JARB software 1985

A truly realistic and interesting golf simulation in hi-res graphics. Each game is different as the fairways are randomly generated. Up to four players can play at a time, and one joystick is required. REDWOOD GOLF is an easy to learn, yet challenging simulation for all ages. On cassette for 32K EXT $24.95

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★ PROFESSIONALLY WRITTEN AND FULLY TESTED ★
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*** USER IS PROMPTED FOR COMPANION ENTRIES AS REQUIRED ***
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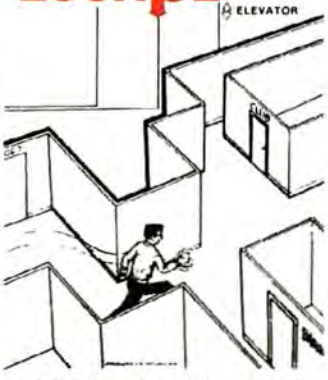
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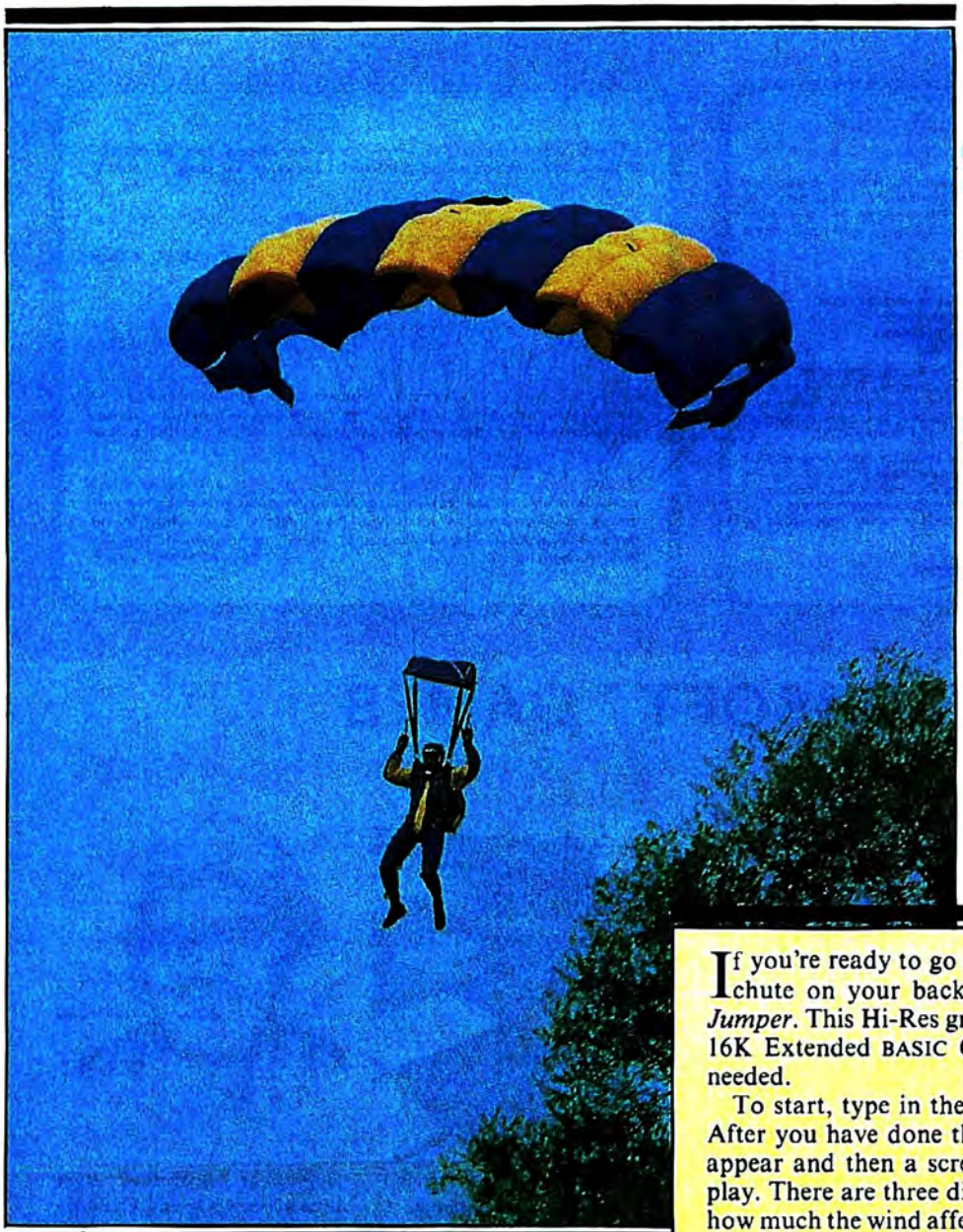


Photo by Neal C. Lauron

THE HIGH ADVENTURE OF PARA-JUMPER

BY WARD POLLOCK

If you're ready to go diving out of airplanes with a parachute on your back, then you're ready to play *Para-Jumper*. This Hi-Res graphics (*PMODE 4*) game requires a 16K Extended BASIC Color Computer. Joysticks are not needed.

To start, type in the program and then save it to tape. After you have done that type *RUN*. The title screen will appear and then a screen asking which level you wish to play. There are three different levels of play. They differ in how much the wind affects you, how much time you have to get to the ground, and how much time you have to view the screen before your plane flies across.

After selecting your level, the playing screen will appear in a second. When it does you will see mountains, TV antennae, lightning bolts and atomic waste clouds. All of these must be avoided. You will also see a platform in the middle of the screen at the bottom. The para-jumper must land here. On a cliff overlooking the landing pad you'll see a mining laser. This fires on a timed schedule based on your level of play (the higher the level, the faster it shoots).

Your jump plane will fly across the top of the screen from right to left. Whenever you are ready to jump, press the down arrow to eject. To control movement, use the left and right arrow keys. The wind blows left and right and effects your horizontal movement. You may have the left key depreseed yet the wind blows right and the para-jumper doesn't move at all. To increase your downward speed (remember you have to get to the bottom in a certain

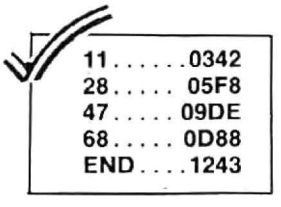
(Tommy Pollock is a freshman at Queensbury High School. He has been programming for three years and has taught at computer camps.)

amount of time) press the down arrow. To eject your chute press the up arrow. You do not have to eject immediately. The longer you wait the more points. However, at about two-thirds of the way down you should eject your chute. Note, the keyboard peeks were used to check the keyboard so you may hold keys down for auto repeat.

You are scored for landing safely, landing as quickly as possible, waiting as long as possible for opening your chute and for how far to the right you were when you jumped.

After you land successfully, you will see your score and be prompted to play again. You may respond by pressing Y to play or N or Q to quit.

I hope you enjoy this program as much as I have in playing it and writing it. If you should have any questions or problems concerning this program, or are just interested in how part of it works, write me at : RD#3 Box 288, Glens Falls, NY 12801. If you would like a copy on cassette or 32K disk, send $4 for tape or $6 disk.



The Listing:

```
0 CLS0:REM###'para-jumper'/INTER
ACTIVE COMPUTER PRODUCTS/WRITTEN
 BY WARD POLLOCK/ 8-2-82###
1 GOTO72
2 GOTO 61
3 CLS0:PMODE4:PCLS
4 PCLS5:PCLS0
5 OP=0:LINE(0,64)-(8,68),PSET:LI
NE(8,68)-(33,92),PSET:LINE(33,92
)-(48,88),PSET:LINE(48,88)-(76,1
32),PSET:LINE(76,132)-(88,156),P
SET:LINE(88,156)-(92,192),PSET
6 PAINT(8,160),5,5
7 LINE(176,192)-(196,172),PSET:L
INE(196,172)-(216,172),PSET:LINE
(216,172)-(220,168),PSET:LINE(22
0,168)-(220,144),PSET:LINE(220,1
44)-(232,132),PSET:LINE(232,132)
-(255,132),PSET:PAINT(250,172),5
,5
8 CIRCLE(124,24),20,5,.33:PAINT(
124,24),5,5:CIRCLE(212,102),25,5
,.4:PAINT(212,102),5,5:CIRCLE(52
,48),30,5,.25:PAINT(52,48),5,5
9 CIRCLE(128,120),25,5,.4:PAINT(
128,128),5,5
10 COLOR5,0:DRAW"BM112,192C5E4R2
4F4"
11 PJ$(0)="NG3NF3U3R1NF2L2NG2R1U
1":AP$="E4R18E2R2G6L8F5L6H5NR7L7
":PJ$(1)="NG3NF3U3R1NF2L2NG2R1NU
2H6E3R7F2G6":LB$="S5BM182,16G16D
12L20G12F6G20S4":AN$="S6E4NF4U18
NL4NR4U4S4":LL$="G8D6L10G6F3G10"
:LR$="BM240,30"+LL$:LL$="BM98,55
"+LL$
12 DRAW"BM165,192C5XAN$;":DRAW"B
M240,131C5U2R2H4R3F4R4D2":DRAW L
L$:DRAW LR$
13 CX=RND(190)+64:CY=RND(98)+30:
IF PPOINT(CX,CY)<>0 THEN CIRCLE(
160,64),10,5,.25:PAINT(160,64),5
,5ELSE CIRCLE(CX,CY),RND(10)+30,
5,.35:PAINT(CX,CY),5,5
14 COLOR5,0:SCREEN1,1
15 PLAY"XT$;L4ABBBCL8FG":FOR AH=
233 TO 5 STEP PS
16 DRAW"BM"+STR$(AH)+",9C5XAP$;"
:DRAW "COXLB$;"
17 IF PEEK(342)=247 THEN 20 ELSE
18
18 FORT=1 TO 25:NEXTT:DRAW"BM"+S
TR$(AH)+",9COXAP$;":DRAW"C5XLB$;
"
19 NEXTAH
20 DRAW"C5XLB$;":PLAY"T55L100ABC
DEFGGFEDCBA":DRAW"BM"+STR$(AH)+"
,9COXAP$;"
21 PX=AH+5:PY=18
22 DRAW"BM"+STR$(PX)+","+STR$(PY
)+"C5XPJ$(OP);":DRAW LB$
23 FOR TI=1 TO LT
24 DRAW"COXLB$;XLL$;XLR$;":DRAW"
BM"+STR$(PX)+","+STR$(PY)+"COXPJ
$(OP);":DRAW"C5XLB$;XLL$;XLR$;"
25 IF PEEK(341)=247 THEN 37
26 IF PEEK(342)=247 THEN 38
27 IF PEEK(343)=247 THEN 35
28 IF PEEK(344)=247 THEN 36
29 PY=PY+DF:WI=RND(WF)-FM:PX=PX+
WI:IF PX<5 THEN PX=5:GW=GW+1ELSE
 GW=GW+1
30 DRAW"BM"+STR$(PX)+","+STR$(PY
)+"C5XPJ$(OP);":IF GW>GT THEN 40
31 IF OP=0 AND PY>110 THEN 42
32 IF PPOINT(PX,PY+3)=5 OR PPOIN
T(PX-3,PY+5)=5 OR PPOINT(PX+3,PY
+5)=5 OR PPOINT(PX,PY-6)=5 OR PP
OINT(PX-3,PY+4)=5 OR PPOINT(PX+3
,PY+4)=5 OR PPOINT(PX+2,PY)=5 OR
 PPOINT(PX-2,PY)=5THEN 42 ELSE 3
4
33 NEXT TI:GOTO 42
34 IF OP=1 THEN IF PPOINT(PX,PY-
8)=5 OR PPOINT(PX+5,PY-6)=5 OR P
POINT(PX-5,PY-6)=5 OR PPOINT(PX-
7,PY-6)=5 OR PPOINT(PX+7,PY-6)=5
 THEN 42 ELSE 33ELSE 33
35 PX=PX-3:IF PX<4 THEN PX=4:GOT
O 29ELSE 29
36 PX=PX+3:IF PX>251 THEN PX=251
:GOTO 29 ELSE 29
37 OS=PY:OP=1:GOTO26
38 PY=PY+(DF-1):GOTO 27
39 GOTO 39
40 IF GG=2 THEN 41 ELSE GG=2:LIN
```

```
E(240,131)-(76,131),PSET:SOUND1,
1:IF PY>127AND PY<138 THEN 42 EL
SE 33
41 GG=0:LINE(240,131)-(76,131),P
RESET:GW=0:GOTO 33
42 IF PY>178 THEN 49
43 DRAW"BM"+STR$(PX)+","+STR$(PY
)+"COXPJ$(OP);"
44 DRAW"A2;BM"+STR$(PX)+","+STR$
(PY)+"COXPJ$(OP);"
45 PY=PY+4:IF PY >190 THEN 47
46 DRAW"BM"+STR$(PX)+","+STR$(PY
)+"C5XPJ$(OP);":GOTO 44
47 COLOR5,0:PLAY"T5L1205GFE01DCB
A":FORT=1 TO 10:LINE(PX,PY)-(RND
(255),RND(25)+75),PSET:SOUND RND
(10),3:NEXTT:FORT=1 TO 3:SOUND R
ND(50),1:SCREEN1,0:SOUND5,1:SCRE
EN1,1:NEXTT:FORT=1 TO 250:NEXTT
48 GOTO 57
49 IF PX>114 AND PX<140 THEN 50
ELSE 43
50 PLAY"T5L803FG04DEFG05ABCDEFL2
G"
51 PLAY"L8DDFFGP2AAABCEFG04DEG05
L6BAL8CFDEL2G"
52 FORT=1 TO 8:RX=RND(255):RY=RN
D(75):FORR=1 TO 18STEP3:CIRCLE(R
X,RY),R,5:NEXTR,T:SOUND 1,2
53 FORT=1 TO 250:NEXTT:SCREEN1,0
:CLS8:TP=LT-TI:IF AH>122 THEN DP
=AH-122 ELSE DP=122-AH
54 SC=(WF+FM+DF+DP+TP+OS+RND(50)
)*A:PRINT@260,"score";:PRINT@266
,"";:FORT=1 TO SC:PRINT@266,T;:N
EXTT
55 PRINT@361,"TO PLAY AGAIN";:PR
INT@386,"INSERT QUARTER OR PRESS
 'Y'";
56 A$=INKEY$:IF LEFT$(A$,1)="Y"
THEN RUN 2 ELSE IF LEFT$(A$,1)="
N" OR LEFT$(A$,1)="Q" THEN 60 EL
SE GOTO 56
57 CLS5:PRINT@196,"MAYBE YOU SHO
ULD TAKE SOME";
58 PRINT@229,"LESSONS WHEN YOU G
ET OUT";
59 PRINT@264,"OF THE HOSPITAL!!!
";
60 E$="-----SO LONG PAL!!!-----"
:PRINT@356,"";:FORT=1 TO LEN(E$)
:PRINTMID$(E$,T,1);:SOUND RND(5)
,2:NEXTT:FORT=1 TO 700:NEXTT:RUN
2
61 CLS0
62 A$=INKEY$:A$="":PRINT@75,"PAR
A-JUMPER";
63 PRINT@169,"LEVELS OF PLAY";
```


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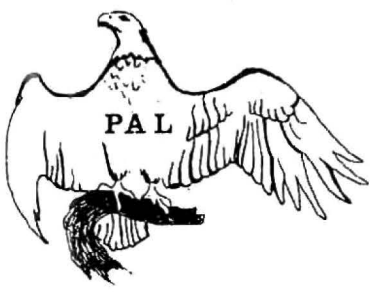
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```
64 PRINT@237,"1";CHR$(128);"EASY
";
65 PRINT@301,"2";CHR$(128);"HARD
";
66 PRINT@365,"3";CHR$(128);"TUFF
";
67 A$=INKEY$:IF A$="" THEN 67 EL
SE A=VAL(A$)
68 IF A<1 OR A>3 THEN GOTO 67 EL
SE ON A GOTO 69,70,71
69 GT=10:DF=3:LT=45:PS=-4:WF=7:F
M=4:T$="T3":PLAY"T55L55056":GOTO
 3
70 GT=9:DF=3:LT=37:PS=-6:WF=9:FM
=4:T$="T8":PLAY"T55L55056":GOTO
3
71 GT=7:DF=4:LT=31:PS=-10:WF=11:
FM=6:T$="T14":PLAY"T55L55056":GO
TO 3
72 PMODE3:PCLS3:PLAY"T3L6AL7BL8C
L9DL10EL11FL13G"
73 PO$="U6R3F1D1G1L3BM+7,3BM+1,0
H1U4E1R2F1D4G1L2BM+6,0NU6R4U1BM+
3,1NU6R4U1BM+3,1BM+1,0H1U4E1R2F1
D4G1L2":DJ$="NG3NF3U3R1NF2L2NG2R
1NU2H7E3R8F3G7":WA$="NU6E2NU1F2U
6BM+3,6U4E2F2D2NL4D2BM+3,0U6R3F1
D1G1L2NL1F3BM+3,0U6R3F1D4G1L3BM+
7,0":DRAW"BM60,190S8C4XWA$;"
74 DRAW"BM+7,0S8C4XPO$;BM+6,0BM+
1,-0H1U4E1R2F1BM+0,+4G1L2BM+6,0U
3NU3R1NE3F3BM+3,0"
75 DRAW"BM128,96C4S29XDJ$;":PW$=
"S8U6R3F1D1G1L3BM+7,3U4E2F2D2NL4
D2BM+3,0U6R3F1D1G1L2NL1F3BM+3,0U
4E2F2D2NL4D2BM+3,0BM+0,-3R4BM+3,
+3S29":PW$(2)="S8BM+0,-1F1R1E1U5
NL1R1BM+3,6BM+0,-1NU5F1R2E1U5BM+
3,6U6F2ND1E2D6BM+3,0U6R3F1D1G1L3
BM+7,3NR4U3NR2U3R4BM+3,+6S29
76 BY$="U6R3F1D1G1NL3F1D1G1L3BM+
7,0BM+0,-3D2F1R2D2L2NH1R2U2U3BM+
3,+3":PW$(3)="S8U6R3F1D1G1L2NL1F
3BM+3,0S29":COLOR4,3:LINE(81,25)
-(176,25),PSET:PAINT(90,20),4,4:
DRAW"BM60,144C4XPW$;XPW$(2);XPW$
(3);":DRAW"S8BM30,170C4XBY$;S29"
:SCREEN1,0
77 FORT=1 TO 8:DRAW"BM128,96C1XD
J$;":SOUND 75,2:DRAW"BM128,96C2X
DJ$;":SOUND200,1:DRAW"BM128,96C4
XDJ$;":SOUND RND(100),1:NEXTT
78 DRAW"S4":SCREEN0,0:PCLS0:GOTO
 2
79 GOTO 79
80 FORT=1 TO 8:CLS8:SOUNDRND(255
),1:NEXTT:POKE65497,0
81 SCREEN1,1:GOTO 81
```


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The Demystification of ML On Disk

By Kevin Davidson

Machine language programs stored on disk need not be a mystery. A little poking around reveals a simple and logical format. Knowledge of the format gives us a useful programming tool.

Machine language programs are usually the product of an assembler program which converts assembly language programs to the actual machine codes used by the 6809 microprocessor in the Color Computer. These programs eventually end up on disk (for disk systems). The BASIC *SAVEM* command uses the same kind of format on disk (called the binary format). As you may be aware, there are three parameters for the *SAVEM* command: the starting address, the ending address and the execution address. It turns out that only the starting and execution addresses actually appear in the binary file.

In the case of *CSAVEM*, an entire memory range is saved. For assembly language, that may not be the case. Some assembly instructions do not result in machine instructions but rather reserve space (for tables, work space and the like). Such instructions include *ORG* and *RMB*. These "empty" spaces do not appear on the disk. Rather, they divide the program into parts, each with a separate starting and ending address.

The disk file consists, then, of one or more program parts (segments), each preceded by a five-byte header. The first byte of the header is an indicator as to the type of segment. A zero indicates that a program segment follows; a 255 indicates that the next segment contains only the execution address and is the last segment. Bytes 2 and 3 are a 16-bit binary number which is the length of the machine language program segment (starting address-ending address). Bytes 4 and 5 are a 16-bit address where the program is to be loaded. If there is only one program segment (as with *SAVEM*) then the next part is the execution address; otherwise, more program segments with identical formats to the first follow. Finally, the program segments end and the first byte of the header contains the value 255. The next two bytes (2 and 3) are zero. Bytes 4 and 5 are the 16-bit execution address.

(Kevin Davidson is vice president for technical services at a Greenville, SC software company. His interests include medical information systems, systems security and programming languages. He's still waiting for son, Patrick, to grow tall enough to reach the CoCo.)

One practical note: When reading a binary file, *LINEINPUT* cannot be used because it ignores many of the binary values used in a machine program (values less than 32 or greater than 127). I chose to use a direct access file with record length 1 for the task. The following program (values less than 32 or greater than 127). I chose to use a direct access file with record length 1 for the task. The following program, *Readbin*, reads a binary file from disk; it displays the memory address and length of each program segment and, at the end, the ending address and execution address. (Be sure to include the filename extension "/BIN" when supplying the filename to *Readbin*).

Given the ability to read and interpret the binary disk file format, we are equipped to write a much more useful program than one to just read the disk. The next program, *Macdata*, will actually generate BASIC *DATA* statements (in ASCII format) from the disk binary files. The statements are ready to be included in your BASIC program and then can be poked into memory and executed via *EXEC* or *USR*.

NOTE: *Macdata* also generates zeros to fill in any space skipped by the assembler between program segments.

The operation of *Macdata* is direct. You are prompted for an input binary file and an output BASIC file (be sure to include file filename extensions). Since you can supply the start line number and increment for the BASIC statements, it should be possible to use the BASIC *MERGE* command to include the generated BASIC *DATA* statements into your program. The automatic generation of *DATA* statements not only saves typing time, but removes the large possibility of errors which are hard to debug.

Both programs will run on a 16K computer, but can handle machine language programs of any size. With the techniques in this article, you are now equipped to experiment with disk binary files. Go get 'em.

Listing 1:

```
10 'READBIN -- READS BINARY
    DISK FILES AND PRINTS INFO
    BY KEVIN DAVIDSON
    EASLEY, SC
20 INPUT"FILENAME";F$
30 OPEN"D",1,F$,1
40 FIELD1,1 AS C$
50 R=1
60 GET#1,R
```

```
70 IF ASC(C$)=255 THEN 190
80 GET#1,R+1
90 L=256*ASC(C$)
100 GET#1,R+2
110 L=L+ASC(C$)
120 GET#1,R+3
130 A=256*ASC(C$)
140 GET#1,R+4
150 A=A+ASC(C$)
160 PRINT "START: ";HEX$(A),"LEN
GTH: ";HEX$(L)
170 R=R+L+5
180 GOTO 60
190 GET#1,R+3
200 E=256*ASC(C$)
210 GET#1,R+4
220 E=E+ASC(C$)
230 PRINT "LAST ADDRESS: "HEX$(A
+L-1)
240 PRINT "EXECUTION ADDRESS: "H
EX$(E)
250 END
```

```
190.... 01A8
END... 03A1
```

Listing 2:

```
10 'MACDATA V1.0
   MACHINE LANGUAGE TO BASIC
   DATA CONVERTER BY
   KEVIN DAVIDSON
20 FILES 2
30 INPUT "BINARY FILE";B$
40 INPUT "BASIC FILE";D$
50 D=2
60 INPUT "BEGINNING LINE #";B
70 INPUT "INCREMENT";I
80 OPEN "D",1,B$,1
90 OPEN "O",D,D$
100 FIELD #1,1 AS C$
110 R=1
120 GOSUB 320 'GET FILE INFO
130 PRINT#D,MID$(STR$(B),2);
140 PRINT#D," 'BEGIN LOAD AT &H"
;
150 PRINT#D,HEX$(X)
160 B=B+I
170 FOR J = 1 TO L
180 GOSUB 490
190 GOSUB 290
200 NEXT
210 LL=L+X+1
220 GOSUB 320
230 IF LL=X THEN 170
240 C=0
250 FOR J=LL TO X
260 GOSUB 290
270 NEXT
280 GOTO 170
290 IF POS(D)=0 THEN PRINT#D,MID
$(STR$(B),2);" DATA ";:B=B+I ELS
E IF POS(D)>200 THEN PRINT#D:GOT
O 290 ELSE PRINT #D,",";
300 PRINT#D,MID$(STR$(C),2);
310 RETURN
320 GOSUB490
330 F=C
340 GOSUB 490
350 L=256*C
360 GOSUB 490
370 L=L+C
380 GOSUB 490
390 X=256*C
400 GOSUB 490
410 X=X+C
420 IF F=255 THEN 430 ELSE RETUR
N
430 PRINT#D
440 PRINT#D,MID$(STR$(B),2);
450 PRINT#D," 'BEGIN EXECUTION A
T &H";
460 PRINT#D,HEX$(X)
470 CLOSE#D,#1
475 PRINT "LAST LINE # USED:";B
480 END
490 GET#1,R
500 R=R+1
510 C=ASC(C$)
520 RETURN
```


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How Fast Is *Your* CoCo?

By Dan Downard
Rainbow Technical Editor

I hope I'm not starting a big argument, but all CoCos do not run at the same speed. We're not going to start a new scoreboard on who's runs the fastest, but the speed of your computer is important for critical timing loops such as I/O and sound generation. This article will introduce you to timing loops and give you a method of measuring the clock frequency of your CoCo.

Don't get alarmed. The clock frequency in the CoCo is crystal controlled and basically all Color Computers run the same speed within a certain tolerance. A trimmer capacitor (C4 on the E-Board) functions to adjust the frequency of the oscillator in the SAM chip. The crystal frequency is 14.31818 MHz. This frequency is divided by four to produce the 3.59 MHz. signal required for the video output. It is again divided by four to produce an .895 Mhz. clock frequency for the 6809E microprocessor. Actually, two clock speeds are made available by using the infamous "high speed poke," POKE65495,0. What the high speed poke does is set the divide logic in the SAM chip to 8 instead of 16, thus giving you a clock frequency of 1.79 MHz.

Microprocessor Timing

How fast is fast? In the "high speed" mode, assuming an average instruction time of 5 machine cycles, dividing the clock frequency by five (1,789,772/5) you get 357,954. Thus, believe it or not, your little CoCo can execute 358,000 machine language instructions in one second. In the "normal" speed mode this figure is reduced to 178,977.

Why do we use timing loops? The best example I can use to illustrate a machine language loop is the printer output routine. If we would disassemble the BASIC ROM at address $A7D3 we would get a printout that looked something like the following:

```
$A7D3 DELAY   LEAX   -01,X    5 cycles
$A7D5         BNE    DELAY    3 cycles
$A7D7         RTS             5 cycles
```

This delay is called by the printer output routine at address $A2BF to provide a half-bit Baud rate delay. The X-register is loaded with the Baud rate constant at $95 before this subroutine is called. Assuming the Baud rate was set to 600, if we examine location $93 we would see $57 or the decimal value 87. We can then calculate the delay:
2*87*8*(1/894886)=.0016 Sec. (.0016=1/6000Baud)

(Dan Downard is an electrical engineer and has been involved in electronics for 24 years through ham radio (K4KWT). His interest in computers began about five years ago and he has built several 68XX systems.)

Explanation:
2 =Convert from half-bit to full-bit
87 =Baud rate constant
8 =Number of cycles in delay loop
(1/895886) = length of one machine cycle

Where did we find the number of cycles for each instruction? In any reference manual for the 6809E microprocessor you will find a list of instructions in mnemonic form. One good source is "TRS-80 Color Computer Assembly Language Programming," Radio Shack Cat. No. 62-2077. Look on Page 271. The number of machine cycles for each instruction is given in this data.

Timing loops are also used for cassette and disk I/O. That is the reason you can't use your cassette or disk while in the high speed mode. Why not change the constants so that we can? We will do exactly that in next month's column.

Timer

A listing is included for a short program called *TIMER* that will tell you how fast your computer is actually running. It is a combination of BASIC and machine language showing how to integrate the two using a *USR* instruction.

The actual operation of the program requires the use of a stopwatch or any accurate timing device. The BASIC part of the program provides user prompts and does the math calculations. The machine language routine is set to delay exactly two minutes. After prompting you to start your timer, a tone is generated indicating the beginning of the loop. At the end of the loop another tone prompts you to stop the watch. Enter the actual time elapsed between the tones, and the program will tell you how fast your computer is running.

Just type in the listing exactly as it is shown and type *RUN*. The machine language part of the program is entered into memory by the BASIC program by using *DATA* and *POKE* statements.

Summary

Don't be alarmed if your computer is not running exactly 894,886 Hz. At the same time, if you wish to adjust the clock frequency, adjust the trimmer capacitor associated with the 14.31818 MHz. crystal. It should be adjacent to the crystal on the circuit board. The notation on the E-Board is C4, but this changed on the 285 Board.

All I/O devices can tolerate a certain amount of drift. If this wasn't the case we could not interchange information with remote devices.

We do not recommend adjusting your clock frequency unless you are having I/O problems and know what you are doing. Obviously, the best method is to measure the clock line with a frequency counter, but how many of us have this facility?

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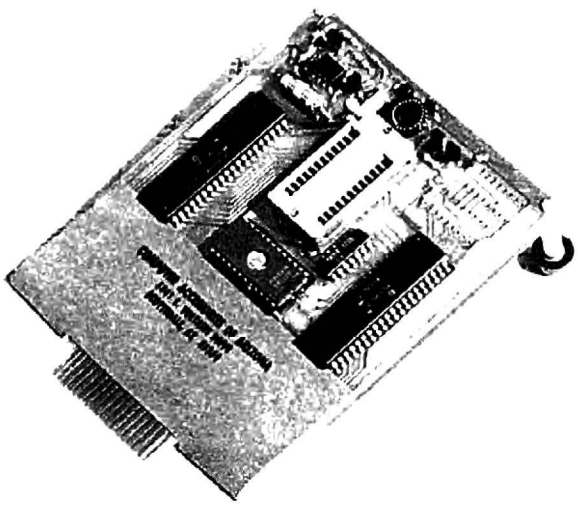
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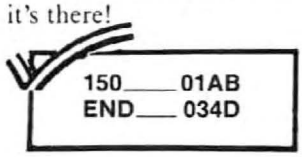
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DEALER INQUIRES INVITED

Next month we will explore doing I/O while using the high speed mode of operation. Not all computers will accept the speedup. See Tony DiStefano's column in January 1983 *Rainbow* for an explanation. For that matter, why use high speed at all when you can execute 179,000 instructions a second without it? Why? Because it's there!




```
10 'CLOCK SPEED TIMER
20 'DAN DOWNARD REV 0
30 'RAINBOW      12/83
40 CLS
50 PRINT"THIS PROGRAM WILL MEASU
RE"
60 PRINT"THE MICROPROCESSOR CLOC
K SPEED"
70 PRINT"OF YOUR COCO.":PRINT
80 PRINT"MEASURE THE INTERVAL BE
TWEEN"
90 PRINT"THE END OF THE FIRST TO
NE"
100 PRINT"AND THE BEGINNING OF T
HE"
110 PRINT"SECOND WITH AN ACCURAT
E"
120 PRINT"CLOCK OR WATCH."
130 PRINT"ENTER THE ELAPSED TIME
 AT"
140 PRINT"THE PROMPT AND YOUR CL
OCK"
150 PRINT"SPEED AND RELATIVE SPE
ED"
160 PRINT"WILL BE DISPLAYED."
170 PRINT
180 INPUT"HIT ANY KEY TO PROCEED
";A$
190 DATA141,2,141,10,134,100,151
,140
200 DATA198,5,189,169,81,57,16,1
42
210 DATA25,150,142,8,0,48,31,38
220 DATA252,49,63,38,245,57
230 FOR X=12288TO12317:READB:POK
EX,B:NEXTX
240 DEFUSR0=12288
250 C=USR0(0)
260 CLS
270 INPUT"ELAPSED TIME IN SECOND
S";D
280 PRINT"THE CLOCK SPEED OF YOU
R COCO"
290 PRINT"IS";(D/120)*894886;"HZ
"
300 PRINT"THIS IS";(D/120)*100;"
% OF THE"
310 PRINT"CRYSTAL FREQUENCY"
320 END
```

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By Tim Nelson

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By Kevin Herrboldt

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By Tim Nelson

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HAPPY GRAPHIC HOLIDAYS

BY DON INMAN

There are times when I want to add text to programs that use graphics. Instead of using a commercial program, I prefer to customize my own text characters. Creating your own provides more freedom of expression and a greater sense of personal satisfaction.

In this month's article, I will explain a simple version of a program in Extended BASIC that you can change and/or expand to fit your own needs.

The program uses *PMODE 4* to provide high resolution and to avoid blurred characters that often occur in the 4-color modes. However, other *PMODE*s can be used. An array of strings that are used in *DRAW* statements to form the text characters are loaded into the program from a subroutine.

Another subroutine is used for the module of your application program. You insert the graphics for which you wish to add text in this subroutine.

A third subroutine is provided to *INPUT* numeric data. An entry must be made for the text character size. Another entry is made to provide the beginning screen line of your text.

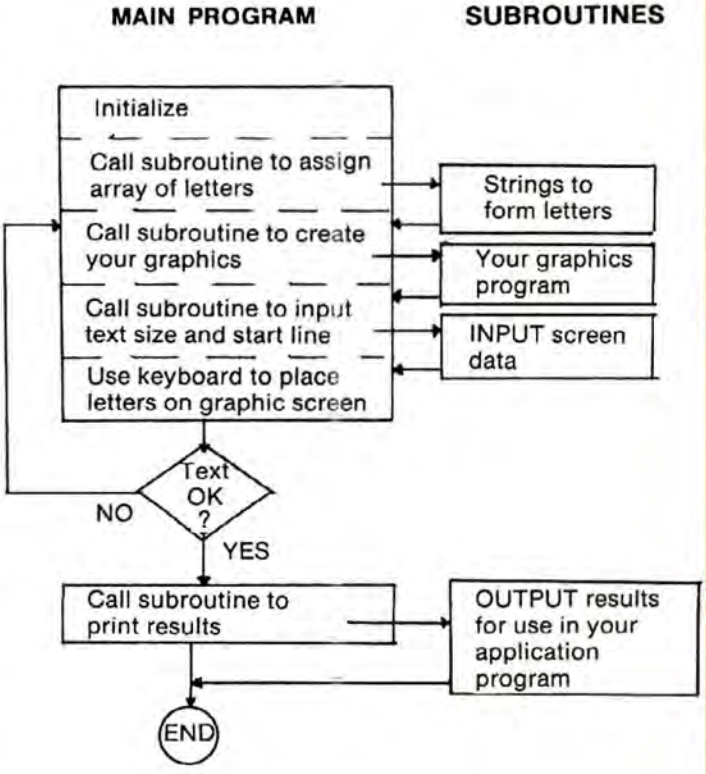
A blinking cursor that appears at the left-most position of the selected line. The space bar is used to move the cursor to the desired point on that line. You then type in the message from the keyboard. Letters that you type are displayed in the size that you selected in the *INPUT* subroutine. The letter array provides for the 26-character alphabet in capital letters, a comma, a period, a space, and the cursor. You can enlarge the array if you wish to provide other symbols.

If you are not satisfied with your text message you may start from the beginning by pressing the up-arrow key. This will clear the screen and display your original graphics with no text. You may then re-enter the inputs that control the size and placement for the text and start over.

When you are satisfied with the text placement, press the down-arrow key. This sends you to another subroutine that will display the results that include:

1) the letter size used,
2) the starting line number of the text, and
3) a list of the array elements used to form your message.

The program flow goes something like this.

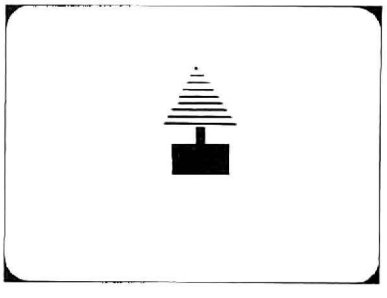


(Don Inman is the acknowledged master of microcomputer graphics and the author of a large number of books, including "TRS-80 Color Computer Graphics and Assembly Language Graphics for the TRS-80 Color Computer" with Kurt Inman.)

The text creator program is presented in a very simple form. Feel free to change or enlarge it to fit your needs. I'll use a sample application to demonstrate and explain its use.

The graphics module, to which text is to be added, is contained in the following subroutine. Line numbers from 200-6999 may be used. Our module is quite short.

```
199 REM ** YOUR PROGRAM HERE **
200 PMODE 4,1
205 PCLS:SCREEN 1,0
210 G1$="R1OU1L1OU1":G2$="U4R1D4
R1"
215 DRAW"BM115,70"+G1$+G1$+G1$
220 DRAW"BM+4,0"+G2$
225 DRAW"BM-22,-4"
230 FOR H=40 TO 2 STEP-4
235 DRAW"R"+STR$(H)+"BU3L"+STR$(
H-2)
240 NEXT H
245 FOR N=1 TO 2000:NEXT N
250 RETURN
```



Graphic Produced

While your graphic is being displayed, you should decide the size of the letters to be used and the screen line at which you wish to start. The input subroutine is:

```
6999 REM ** INPUTS **
7000 W$=""
7005 INPUT"LETTER SIZE (1-8)";S$
7010 INPUT"STARTING LINE";L
7015 PMODE 4:SCREEN 1,0
7020 X=2:C$=STR$(X)
7025 M=INT(72/VAL(S$))
7030 K=VAL(S$)*2+2
7035 RETURN
```

The inputs are accepted in this subroutine using the text screen which displays:

```
LETTER SIZE (1-8)  ?
```

Although you may use much larger letters, a range of 1-8 is suggested by the prompt. Due to the way in which the letters are formed, the even values of 2, 4, 6, and 8 will look best. The following table shows the number of characters per line and the number of lines that will fit the screen for each letters size.

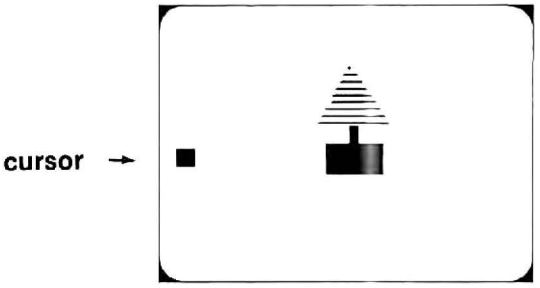
Letter Size	Characters Per Line	Number Of Lines
2	40	30 (2-31)
4	20	17 (2-18)
6	13	11 (2-12)
8	10	8 (2-9)

A size of 4 was used for our example.

Next Display

```
LETTER SIZE (1-8) ?4
STARTING LINE?
```

After entering the starting line (10 in our example), the program returns to the graphic screen. A cursor blinks at the left side of the selected line.



The cursor is controlled by this subroutine.

```
8999 RE ** CURSOR CONTROL **
9000 GET(X-2,Y-8)-(X+16,Y+16),F,
G
9005 A$=INKEY$
9010 IF A$<>"" THEN 9035
9015 DRAW"S"+S$+"C1;BM"+C$+","+Y
$+L$(30)
9020 DRAW"S"+S$+"C0;BM"+C$+","+Y
$+L$(30)
9025 PUT(X-2,Y-8)-(X+16,Y+16),F,
PSET
9030 GOTO 9005
9035 COLOR 1,0:PUT(X-2,Y-8)-(X+1
6,Y+16),F,PSET
9040 RETURN
```

Now it is time to enter text from the keyboard. In our example this was:

(8 spaces) HAPPY (carriage return)
(6 spaces) HOLIDAYS



If you wish to change your message, press the up-arrow key. This will erase the graphic screen, erase the text screen, redraw the graphic, and request new inputs. Try again.

When you are satisfied with the text placement, press the down-arrow key. This will print the values to be used for the text in your application program. The subroutine that provides the output is:

```
7999 REM ** PRINT RESULTS **
8000 PRINT#-2,"FOR YOUR PROGRAM
"
8005 PRINT#-2,"S$ =";S$
8010 PRINT#-2,"L =";L
8015 PRINT#-2,"TEXT LETTERS WERE
 -"
8020 FOR R=L TO M
8025 PRINT#-2
8030 FOR C=1 TO Q
8035 IF W(C,R)=0 GOTO 8045
8040 PRINT#-2,"L$("+MID$(STR$(W(
C,R)),2,2)+"),";
8045 NEXT C
8050 PRINT#-2
8055 NEXT R
8060 RETURN
```

If you wish to display the results on the screen rather than send them to your printer, change all the *PRINT#-2* statements in this subroutine to *PRINT* statements. The output for the example was:

```
FOR YOUR PROGRAM
S$ =4
   = 10
TEXT LETTERS WERE -

L$(27),L$(27),L$(27),L$(27),L$(27),L$(27),L$(27),L$(27),
  L$8,L$(1),L$(16),L$(16),L$(25),
L$(27),L$(27),L$(27),L$(27),L$(27),L$(27),L$(8),L$(15),
L$(12),L$(9),L$(4),
```

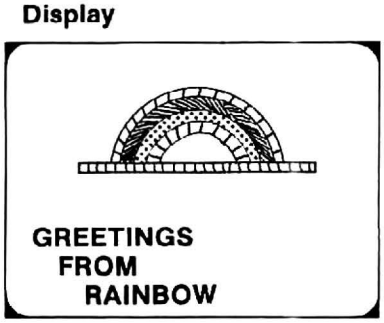
If you want to add more than one graphics/text module to your application program, change the subroutine at Line 200 to create your next module. The text creator program can be used as many times as you need.

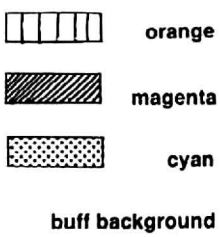
A second example provides something a little more colorful by changing to *PMODE 3*. Make the following changes to your program.

```
120 DRAW "S"+S$+L$(N)
7015 PMODE 4:SCREEN 1,0
9015 DRAW"S"+S$+"C1;BM"+C$+","+Y
$+L$(30)
9020 DRAW"S"+S$+"C0;BM"+C$+","+Y
$+L$(30)
9035 COLOR 1,0:PUT(X-2,Y-8)-(X+1
6,Y+16),F,PSET

199 REM ** YOUR PROGRAM HERE **
200 PMODE 3,1
205 PCLS:SCREEN 1,1
210 FOR N=85 TO 45 STEP-10
215 CIRCLE(128,90),N,8,1,.5
220 NEXT N
225 DRAW"BM43,90;C8;R175D1L175D1
R175D1L175"
230 PAINT(50,68),8,8
235 PAINT(60,68),7,8
240 PAINT(72,68),6,8
245 PAINT(82,68),8,8
250 FOR N=1 TO 2000:NEXT N
255 RETURN
```

Display





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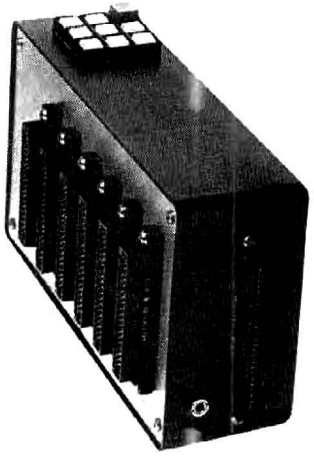
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Output

```
FOR YOUR PROGRAM
S$ = 6
L  = 8
TEXT LETTERS WERE —

L$(7),L$(18),L$(5),L$(5),L$(20),L$(9),L$(14),L$(7),L$(19)
  ,L$(29),
L$(27),L$(27),L$(6),L$(18),L$(15),L$(13),L$(29)
L$(27),L$(27),L$(27),L$(27),L$(18),L$(1),L$(9),L$(14),L$
  (2),L$(15),L$(23),
```

The listing:

```
155____024B
8015____0455
9999____05F8
END____0957
```

```
10 REM ** TEXT CREATOR **
15 REM ** MAIN PROGRAM **
20 CLS:CLEAR 500:DIM L$(30):DIM
F(40):DIM W(40,30)
25 GOSUB 10000
30 GOSUB 200
35 GOSUB 7000
40 FOR R=L TO M
45 Y=(R-1)*K+K:Y$=STR$(Y)
50 DRAW "S"+S$+"BM"+C$+","+Y$
55 Q=INT(80/VAL(S$))
60 FOR C=1 TO Q
65 GOSUB 9000
70 W$=W$+A$:N=ASC(A$)-64
75 N=ASC(A$)-64
80 IF N=-54 THEN M=R:GOTO 145
85 IF N=30 THEN PCLS:CLS:GOTO 30
```


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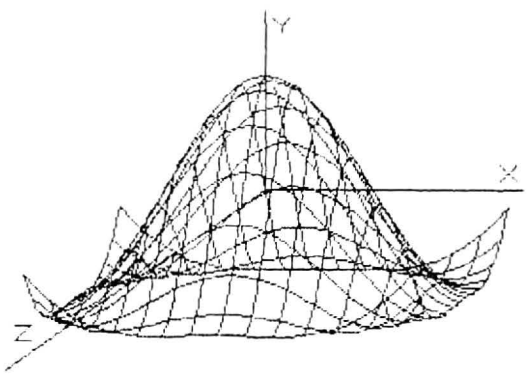
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```
90 IF N=-51 THEN W(C,R)=29:C=Q:G
OTO 130
95 IF (N<1 AND N<>-20 AND N<>-18
 AND N<>-32) OR N>26 THEN 65
100 IF N=-20 THEN N=28
105 IF N=-18 THEN N=29
110 IF N=-32 THEN N=27
115 W(C,R)=N
120 DRAW "S"+S$+L$(N)
125 X=C*VAL(S$)*3+2:C$=STR$(X)
130 NEXT C
135 C$="2"
140 NEXT R
145 CLS:GOSUB 8000
150 END
155 '
199 REM ** YOUR PROGRAM HERE **
200 PMODE 4,1
205 PCLS:SCREEN 1,0
210 G1$="R10U1L10U1":G2$="U4R1D4
R1"
215 DRAW"BM115,70"+G1$+G1$+G1$
220 DRAW"BM+4,0"+G2$
225 DRAW"BM-22,-4"
230 FOR H=40 TO 2 STEP-4
235 DRAW"R"+STR$(H)+"BU3L"+STR$(
H-2)
240 NEXT H
245 FOR N=1 TO 2000:NEXT N
250 RETURN
255 '
6999 REM ** INPUTS **
7000 W$=""
7005 INPUT"LETTER SIZE (1-8)";S$
7010 INPUT"STARTING LINE";L
7015 PMODE 4:SCREEN 1,0
7020 X=2:C$=STR$(X)
7025 M=INT(72/VAL(S$))
7030 K=VAL(S$)*2+2
7035 RETURN
7040 '
7999 REM ** PRINT RESULTS **
8000 PRINT#-2,"FOR YOUR PROGRAM
"
8005 PRINT#-2,"S$ =";S$
8010 PRINT#-2,"L =";L
8015 PRINT#-2,"TEXT LETTERS WERE
 —"
8020 FOR R=L TO M
8025 PRINT#-2
8030 FOR C=1 TO Q
8035 IF W(C,R)=0 GOTO 8045
8040 PRINT#-2,"L$("+MID$(STR$(W(
C,R)),2,2)+"),";
8045 NEXT C
8050 PRINT#-2
8055 NEXT R
8060 RETURN
8065 '
8999 RE ** CURSOR CONTROL **
```

```
9000 GET(X-2,Y-8)-(X+16,Y+16),F,
G
9005 A$=INKEY$
9010 IF A$<>"" THEN 9035
9015 DRAW"S"+S$+"C1;BM"+C$+","+Y
$+L$(30)
9020 DRAW"S"+S$+"C0;BM"+C$+","+Y
$+L$(30)
9025 PUT(X-2,Y-8)-(X+16,Y+16),F,
PSET
9030 GOTO 9005
9035 COLOR 1,0:PUT(X-2,Y-8)-(X+1
6,Y+16),F,PSET
9040 RETURN
9045 '
9999 REM ** DATA FOR LETTERS **
10000 L$(1)="U8R8D4L8BR8D4BR4"
10005 L$(2)="U8R8D4L8BR8D4L8BR12
"
10010 L$(3)="U8R8BD8L8BR12"
10015 L$(4)="U8R8D8L8BR12"
10020 L$(5)="U8R8BD4L8BD4R8BR4"
10025 L$(6)="U8R8BD4L8BD4BR12"
10030 L$(7)="U8R8BD4L4BR4D4L8BR1
2"
10035 L$(8)="U8BR8D8BU4L8BD4BR12
"
10040 L$(9)="BU8R8BL4D8BL4R8BR4"
10045 L$(10)="U4BU4BR8D8L8BR12"
10050 L$(11)="U8BR8G4L4BR4F4BR4"
10055 L$(12)="U8BD8R8BR4"
10060 L$(13)="U8F4E4D8BR4"
10065 L$(14)="U8F8U8BD8BR4"
10070 L$(15)="U8R6D8L6BR12"
10075 L$(16)="U8R8D4L8BD4BR12"
10080 L$(17)="U8R8D8H4BG4R8BR4"
10085 L$(18)="U8R8D4L8BR4F4BR4"
10090 L$(19)="BU4U4R8BD4L8BR8D4L
8BR12"
10095 L$(20)="BU8R8BL4D8BR8"
10100 L$(21)="U8BR8D8L8BR12"
10105 L$(22)="BU8D4F4E4U4BD8BR4"
10110 L$(23)="U8BR8D8H4G4BR12"
10115 L$(24)="E8BL8F8BR4"
10120 L$(25)="BU8F4E4BG4D4BR8"
10125 L$(26)="BU8R8G8R8BR4"
10130 L$(27)="BR12"
10135 L$(28)="D2G1BE1BU2BR12"
10140 L$(29)="D1BU1R1BR11"
10145 L$(30)="BE1U6BR2D6BR2U6BU1
BL5BD8"
10150 RETURN
```


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Script Provides Remedial Help In Reading And Spelling

By John Plaxton

Script is a 16K Extended BASIC program that is designed to help slow readers improve their reading and spelling skills. It is meant to be used with both a student and an instructor/parent, but, although not as effective, it can be used by the student alone.

Script uses *PMODE3* to generate lowercase, "written" letters; vowels and consonants are different colors. Written letters may be more conducive than printed letters to teach a student that spelling progresses from left to right. Unlike commercial publications and advertisements, which normally use the printed word, *Script* continually reinforces the hand writing approach, which is most used in school.

Prior to each lesson, at least five words must be placed in a *DATA* statement or statements (for example: 200 DATA A, HOP, MUCH, RUN, QUICK). The total number of words must be 150 or less and each word must contain 11 or fewer letters. These words will be displayed by random selection.

The duration of each lesson is set by the student. In addition to this time limit, the lesson will end if the number of displayable words is less than ten.

Each word can be displayed a maximum of three times. (A data base of five words will provide 15 displayable words.) This limit is included to ensure that one word is not displayed excessively, to the exclusion of other words in the lesson.

For each lesson, the student and instructor will have a choice of one of three display modes. The first mode selects and flashes a word, then spells the word letter-by-letter; as each letter is added to the display, the student should say the sound indicated by the letter. The second mode selects and spells a word, and the student can then type the letters required to spell that word. Again, the student should say each sound as he/she types it. The third mode selects, spells and momentarily displays the word, then the student, without being able to see the word, can type the required letters. Each of these modes can be selected with the option of preventing re-display of any word, on the instructor's prerogative. In any mode, when the word first appears, and also when the word has been completed, the student and/or instructor should say the word.

The first mode provides audio and visual association, the second provides audio, visual and kinesthetic associations, and the third mode provides all three associations plus the requirement for memory recall.

Because *Script* assists in spelling by phonetics, a special feature is the display of paired, two-letter sounds (diagraphs) such as "ck," "th," and "qu." In addition, data words can be entered with asterisks to provide a display of words separated into syllables.

In summary, *Script* provides three display options as an aid to improved spelling and reading of the written word. Special features include the common diagraphs and the capability of breaking a word into syllables. Best results will be achieved with the instructor and/or the student vocalizing the words and the sounds of the letters as each appear.

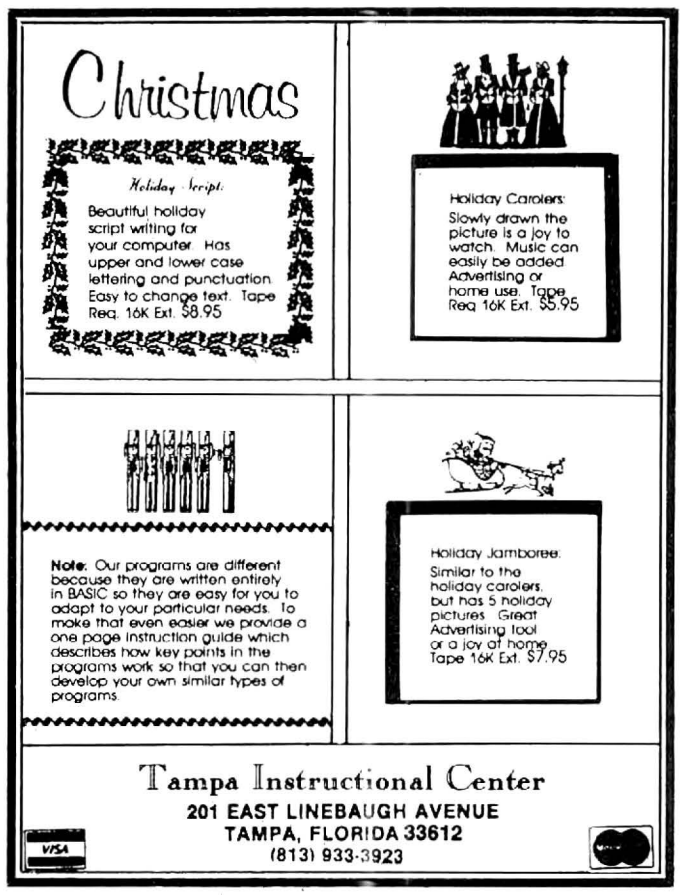
(John Plaxton, sole owner of Cancoco Software, is an air navigator in the Canadian Armed Forces and is presently working in the aerospace engineering and test establishment. He wrote this initial version in 1982 —after consultation with a resource teacher—for his son who has a minor audio-visual handicap.)

936	0256	1864	0D82
1112	0411	2024	105D
1344	0649	2208	1244
1480	0939	2320	13CD
1680	0BAE	END	15B1

The listing:

```
8 CLS7:PRINT@236," SCRIPT ";
16 PRINT@504,"plaxton";
24 '
```

```
32 'data to be input prior to
40 'lesson.  must be at least
48 '11 words, but fewer than
56 '151, all of which must have
64 'ten (10) or fewer letters.
800 DATA STOP1
808 'initialize variables
816 X=RND(-TIMER*TIMER)
824 DIM LT$(32),L(150),D1(12),D1
$(11)
832 'preset max # of displays
840 FOR X=0TO150:L(X)=3:NEXT X
848 GOSUB1344'generate script
856 GOSUB1568'display script
864 GOSUB1760'introduction
872 RESTORE:D=0:N=0:N1=0
880 READ D$:IF D$="STOP1" THEN89
6
888 D=D+1:GOTO880
896 TIMER=0
904 'randomly get word
912 IF TIMER>T1 THEN2152
920 DL=RND(D)-1
928 RESTORE:FOR X=0TO DL
936 READ D$
944 NEXT X
952 'display most of the words
960 'but allow lesson to end
968 DS=0
976 FOR X=0TO D
984 IF L(X)<1THEN NEXT X
992 DS=DS+L(X)
1000 NEXT X
1008 IF DS<10THEN GOSUB2152'end
1016 IF L(DL)=<0THEN920ELSE L(DL
)=L(DL)-1
1024 'flash printed word
1032 CLS(RND(9)-1)
1040 PRINT@235," ";D$;" ";
1048 FOR T=0TO40:NEXT T
1056 FOR S=1TO LEN(D$)
1064 'display word in script
1072 PMODE3,1:PCLS5:SCREEN1,1
1080 DRAW"C6;S8"
1088 DRAW"BM10,100"
1096 FOR S=1TO LEN(D$)
1104 D1$(S)=RIGHT$(LEFT$(D$,S),1
)
1112 IF D1$(S)="*" THEN D1(S)=0:
GOTO1128
1120 D1(S)=ASC(D1$(S))-64
1128 NEXT S
1136 D1(S)=0'space
1144 FOR S=1TO LEN(D$)
1152 DRAW";XLT$(D1(S));"
1160 NEXT S
1168 FOR S=0TO200:NEXT S
1176 PCLS5
1184 IF Z<3 THEN DRAW"BM10,100"
ELSE DRAW"BM10,50"
1192 FOR S=1TO LEN(D$)
1200 GOSUB2352'diagraph?
1208 DRAW";XLT$(D1(S));"
1216 IF D1(S)=0 THEN1240
1224 SOUND175,1
1232 FOR T=0TO500:NEXT T
1240 NEXT S
1248 'reinforce whole word
1256 FOR S=1TO4
1264 SCREEN1,0
1272 FOR T=0TO100:NEXT T
1280 SCREEN1,1
1288 FOR T=0TO100:NEXT T
1296 NEXT S
1304 N=N+1'count # of words
1312 IF Z>2 THEN GOSUB1960'input
 required
1320 IF Z=2OR Z=4OR Z=6THEN GOSU
B2104'prevent redisplay
1328 GOTO904'get another word
1336 'generate script
1344 LT$(0)="BM+11,0"'space
1352 LT$(1)="C7RE3F3R2E2G2L2H3U4
E2R3FRUD9RC6"'a
1360 LT$(2)="RE5U9H2GD14UE5R2FD4
G2L4HFR6"'b
1368 LT$(11)="RE5U9H2GD14UE5R2FD
2GL5R2F3R"'k
1376 LT$(4)="E2F2R3E2BL7U3E2R4FH
2U7EFD13F2"'d
1384 LT$(3)="RE2BE5RUHL3G2D5F2R3
```

```
EF"'c
1392 LT$(5)="C7R3E4U3H2G2D3F4R2C
6"'e
1400 LT$(6)="R4E4U9H3GD22F2E2U3H
4R5"'f
1408 LT$(9)="C7R4URU8BUUDBDD8RDR
4C6"'i
1416 LT$(15)="C7E2F2R2E2U5H2L2G2
D5U5BRRFR4BD6C6"'o
1424 LT$(21)="C7R2E2U7D7F2RE2U7D
8FRC6"'u
1432 LT$(7)="E3F2R2EBUBL4LU4E2R2
F2D14LDL3UHU2E2R2UER"'g
1440 LT$(8)="R2E3U2RU9H2GD15U5E2
R3F2D4FR"'h
1448 LT$(17)="E3F2R2EBUBL4LU4E2R
2F2D14F2E2U3H4R3"'q
1456 LT$(10)="R3E4URURU2BUUDBDD1
4LDL3UHUE2R2UER2"'j
1464 LT$(12)="R4E4U10H2G2D10F4R3
"'l
1472 LT$(13)="E2U6EFD8U7E2RF2D7U
7E2RF2D6FR"'m
1480 LT$(14)="E2U6EFD8U7E2R3F2D6
FR"'n
1488 LT$(16)="E2D2FD8LU18D3E3RF2
D5G2L3R7"'p
1496 LT$(18)="RE2U7F2DFR3ED5FR"'
r
1504 LT$(19)="RE2UE2UEU2F2RD2RD3
G2L3H2F2R6"'s
1512 LT$(20)="R4URU14RD4L5R8L3D1
0RDR3"'t
1520 LT$(22)="E3U6D6F3E3U5EBD8BF
"'v
1528 LT$(23)="E3U6D6F2DUE2F2DUE2
U5EBD9BR"'w
1536 LT$(24)="EBU4U3ERF3D3G3BRBE
7UHG3D3F3R"'x
1544 LT$(26)="E2U4E3R5F2D2G4F2D6
LDL3UHUE2R2UER3"'z
1552 LT$(25)="C7R2E2U7D6F2RE2U6D
16LDL3UHU2E2R2UER2C6"'y
1560 RETURN
1568 'display/proof script
1576 PCLS5:PMODE3,1:PCLS5:SCREEN
1,1
1584 DRAW"BM10,50;S8;C7"
1592 D=0
1600 FOR T=1TO10
1608 D=D+1
1616 FOR Q=0TO100:NEXT Q
1624 DRAW";XLT$(D);"
1632 NEXT T
1640 DRAW"BM10,100;"
1648 FOR T=1TO10
1656 D=D+1
1664 FOR Q=0TO100:NEXT Q
1672 DRAW";XLT$(D);"
1680 NEXT T
1688 DRAW"BM10,150;"
1696 FOR T=1TO6
1704 D=D+1
1712 FOR Q=0TO100:NEXT Q
1720 DRAW";XLT$(D);"
1728 NEXT T
1736 DRAW SP$
1744 FOR T=0TO1000:NEXT T
1752 RETURN
1760 'instructions
1768 CLS:SCREEN0,0
1776 PRINT@132,"please tell me y
our name"
1784 PRINT@266,"";
1792 INPUT N$
1800 CLS
1808 PRINT@96,"DO YOU WANT  NORM
AL(1)   OR                  DOUB
LE(2)  SPEED"
1816 PRINT"                      "
;:INPUT Z
1824 PRINT:PRINT"  HOW LONG DO Y
OU WANT TO PLAY,            IN MI
NUTES"
1832 PRINT"                  ";:INP
UT T1
1840 T1=T1*3600
1848 POKE 65494,0
1856 IF Z=2THEN POKE 65495,1
1864 CLS:PRINT
1872 PRINT"MAKE YOUR SELECTION A
S INDICATED              BELOW."
1880 PRINT"1.  SPELL THE WORD BY
 DISPLAYINGINDIVIDUAL LETTERS IN
 SEQUENCE."
1888 PRINT"2.  SPELL THE WORD AN
D  PREVENT REDISPLAY BY PRESSING
 SPACEBAR."
1896 PRINT"3.  DISPLAY THE WORD,
 THEN TYPE THE LETTERS USING THE
 KEYBOARD."
1904 PRINT"4.  DITTO 3 + PREVENT
 REDISPLAY.";
1912 PRINT"5.  FLASH  THE  WORD,
 THEN TYPE THE LETTERS USING THE
 KEYBOARD."
1920 PRINT"6.  DITTO 5 + PREVENT
 REDISPLAY.";
1928 PRINT:PRINT"SELECT 1, 2, 3,
 4, 5 OR 6 ";:INPUT Z
1936 IF Z=1 OR Z=2 OR Z=3 OR Z=4
 OR Z=5 OR Z=6 THEN1952
1944 GOTO1760
1952 RETURN
1960 'get keyboard input
1968 IF Z=5 OR Z=6 THEN PCLS5're
move word
1976 DRAW"BM10,140"
1984 SOUND220,1
1992 FOR S=1TO LEN(D$)
```

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```
2000 IF D1(S)=0THEN S=S+1
2008 FOR T=0TO700
2016 IN$=INKEY$:IF IN$=""THEN204
0
2024 IF ASC(IN$)=64+D1(S)THEN SO
UND177,1:GOTO2056
2032 SCREEN1,0:FORQ=0TO50:NEXT Q
:SCREEN1,1
2040 NEXT T
2048 SOUND175,1
2056 DRAW";XLT$(D1(S));"
2064 NEXT S
2072 SCREEN1,0
2080 FOR T=0TO300:NEXT T
2088 SCREEN1,1
2096 RETURN
2104 'prevent redisplay
2112 SOUND220,3
2120 FOR T=0TO500
2128 IF INKEY$<>""THEN L(DL)=-1:
N1=N1+1:RETURN
2136 NEXT T
2144 RETURN
2152 'end lesson
2160 POKE 65494,0
2168 CLS
```


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RAINBOW CERTIFICATION SEAL


```
2176 PRINT@68,"THANK YOU, ";N$
2184 IF N<>0THEN2216
2192 PRINT:PRINT"     BUT YOU HAV
E FORGOTTEN TO                ENT
ER DATA."
2200 PRINT:PRINT"     ENTER DATA
BETWEEN LINES                 88 A
ND 788."
2208 PRINT:PRINT"EXAMPLE:     100
DATA SCRIPT,WILL,HELP,YOU,LEARN,
TO,SPELL":END
2216 PRINT:PRINT"     YOU STUDIED
 ";N;" WORDS."
2224 IF Z=1 OR Z=3 OR Z=5 THEN22
72
2232 PRINT:PRINT"     YOU REMOVED
 ";N1;" WORDS."
2240 N2=INT(N1*100/N)
2248 PRINT:PRINT"THAT IS ";N2;"
PERCENT."
2256 PRINT"      ":IF N2>75THEN P
RINT"VERY ";
2264 IF N2>50THEN PRINT"WELL DON
E ";N$;"."
2272 PRINT"      ":PRINT"YOU TOOK
 ";INT(TIMER/360)/10;" MINUTES."
2280 IF Z=1 OR Z=3 OR Z=5 THEN23
36
2288 FOR T=0TO5000:NEXT T
2296 CLS:N=0
2304 RESTORE:FOR T=0TO D
2312 READ M$:IF L(T)=-1 THEN PRI
NT M$;" ";:N=N+1
2320 NEXT T
2328 PRINT:PRINT:PRINT"YOU REMOV
ED ";N;" WORDS."
2336 PRINT:PRINT"I HOPE WE WILL
PLAY AGAIN SOON."
2344 END
2352 'print diagrap combinations
2360 IF D1(S)<>3THEN2376
2368 IF D1(S+1)=8THEN2480'ch
2376 IF D1(S)<>19THEN2392
2384 IF D1(S+1)=8THEN2480'sh
2392 IF D1(S)<>23THEN2408
2400 IF D1(S+1)=8THEN2480'wh
2408 IF D1(S)<>20THEN2424
2416 IF D1(S+1)=8THEN2480'th
2424 IF D1(S)<>3THEN2440
2432 IF D1(S+1)=11THEN2480'ck
2440 IF D1(S)=17THEN2480'qu
2448 IF D1(S)<>19THEN2464
2456 IF D1(S+1)=23THEN2480'sw
2464 '
2472 RETURN
2480 DRAW";XLT$(D1(S));"
2488 S=S+1
2496 FOR T=0TO100:NEXT T
2504 RETURN
```

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Menu Maker

By Jorge Mir

Just about every program written starts up with a menu for the user to choose from in order to enter the various subroutines included in the program. As a general rule, menus should contain a few items which can then be followed by various submenus for additional choices. About five or six items should be the limit on each menu and submenu for ease of use.

One of the reasons people shy away from menus is the figuring that must take place in order to properly center the items on the screen and give the menu that professional look found in most of the commercially available programs. The alternative chosen by many is just to list the items on the screen rather than spend the time figuring the various *PRINT*@ points.

Well, the program listed below can be used as a subroutine in order to prepare those professional looking menus for you, saving you a lot of figuring time, as well as allowing you to have as many menus as required using only a minimum amount of valuable RAM space.

In order to prepare a menu, all you have to do is create a string with the title and the items you want listed on the menu. For example, if you want a menu entitled "MAIN MENU" and you want to have several choices available such as, "Enter data," "Load data," "Save data," "Print data," and "Exit program" then all you have to do is include the following line in your program:

```
10 D$ = "MAIN MENU,ENTER DATA, LOAD DATA,
SAVE DATA, PRINT DATA,EXIT PROGRAM":
GOSUB 10000: ON 1 GOTO 100, 200, 300, 400
```

You can then enter the various subroutines to enter, load, save, and print the data or exit the program.

The subroutine can also be used to center a heading for display purposes. For example, if you want to set up a heading called "Loading Program" followed by instructions, etc., then the program step should read as follows:

```
200 D$="LOADING PROGRAM": GOSUB 10000
210 INPUT "ENTER PROGRAM NAME"; PG$
```

You can then continue with the subroutine as required.

I hope this program helps you in developing useful menus with a minimum of effort.

(Jorge Mir, a Certified Public Accountant, is currently controller of a Fortune 500 Corporation. Personal computing is his main hobby and he publishes most of his original work through the Rainbow.)

The listing:

```
10000 '**** PRINT MENU ****
10010 LN=0:LL=0:MG=0:MD=1
10020 GOSUB10070:CLS:TB=INT((32-
LEN(DT$))/2)
10030 PRINT TAB(TB)DT$:PRINT TAB
(TB)STRING$(LEN(DT$),CHR$(131))
10040 IF INSTR(D$,",")=0 THEN RE
TURN
10050 GOSUB10070:LN=LN+1:IF LEN(
DT$)>LL THEN LL=LEN(DT$)
10060 DT$(LN)=DT$:IF CM=0 THEN 1
0110 ELSE 10050
10070 CM=INSTR(MID$(D$,MD),",")
10080 IF CM=0 THEN DT$=MID$(D$,M
D):GOTO10100
10090 DT$=MID$(D$,MD,CM-1):MD=MD
+CM
10100 RETURN
10110 MG=INT((26-LL)/2):MG$=STRI
NG$(MG," ")
10120 FOR X=1TO (10-LN)/2:PRINT:
NEXTX
10130 FOR X=1TOLN:PRINTMG$;X"- "
;DT$(X):NEXTX
10140 PRINT @457,"";:INPUT"YOUR
CHOICE";I
10150 IF I<1 OR I>LN THEN SOUND1
00,2:GOTO10140
10160 PRINT@457,STRING$(15," ");
:RETURN
```

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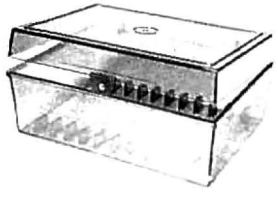
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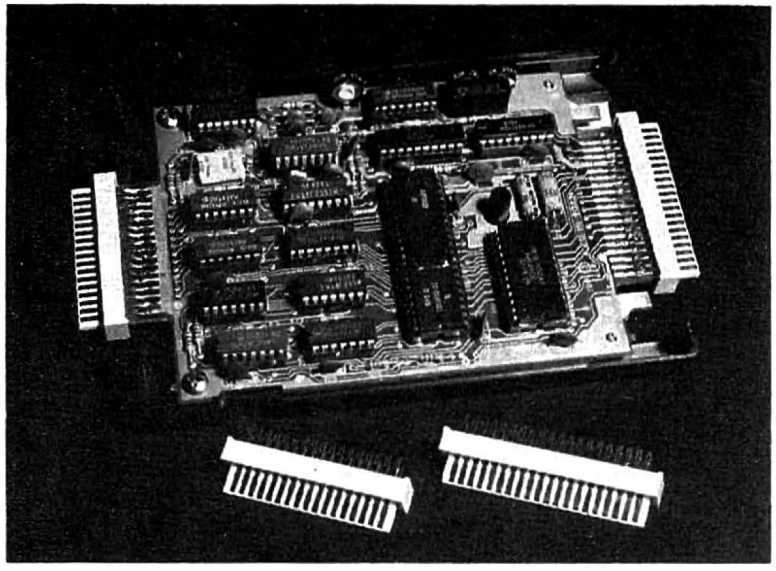
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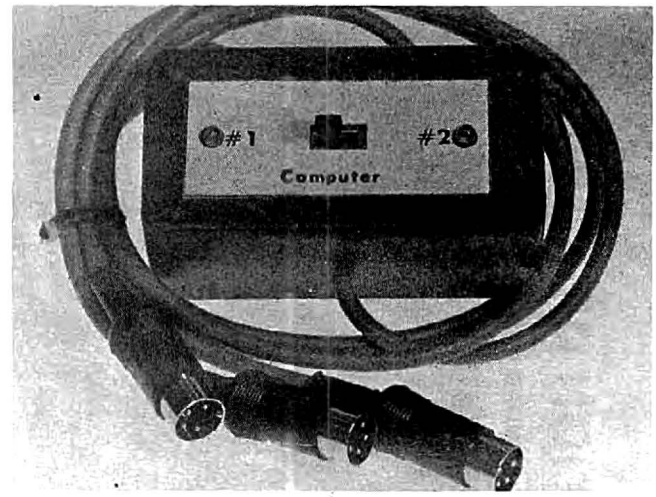
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BUILD AN RS-232 DEVICE SELECT SWITCH FOR UNDER $20



By David Owen

One of the unfortunate drawbacks of the Radio Shack Color Computer is that it has only a single RS-232 port. There are now available a number of peripheral devices; however owning more than one of these devices requires that they be plugged in and unplugged as appropriate. This is particularly annoying if you use a modem and a printer, and you need to use the printer while you are on-line.

A simple and inexpensive solution is to build your own RS-232 switch. Once you have bought all of the materials (about $17) it will take about an hour to construct it from the instructions I have provided. All of the materials are available at your local Radio Shack store.

The switch uses cables rather than female plugs and two LEDs. An added advantage of the LEDs is that as long as the computer is on, one of the LEDs will remain lit. This helps to avoid leaving your system on overnight (as I have done a number of times). The switch can also be modified easily to add LEDs to the remaining lines which will display all communication activity through the RS-232 port.

The following instructions break down into several sections: first, a listing of the materials required; second, a list of the tools required:third, a step-by-step list of instructions to prepare and construct the switch; fourth, a schematic and wire connection guide and finally, a set of templates to help in drilling the correct locations on the box.

When you have finished building your switch box, cut out the remaining template and glue it on the top of the box. This will cover the switch hole and screws, as well as adding a slightly more professional touch to your work.

(David Owen is the owner of CoFor Systems, which specializes in software and hardware design with an emphasis on menued management systems for mainframes applications. He is also an admissions counselor and systems operator for the ROTC department at Arizona State University.)

The Parts Listing

Radio Shack Pt. #	Description	Quantity	Cost
270-231	Experimenter Box	1	$1.69
276-018	LEDs	2	1.79
270-045	Speaker Switch	1	2.99
271-1311	100 Ohm resistors	2	.39
	4-Pin DIN Cables (male to male)	2	9.96

Tools And Materials Required

Phillips head screw driver (medium-small)
Soldering iron and electronics grade solder
Electric drill
Wire stripper
Razor knife
Needle nose pliers
Electrical tape

The Instructions

1) Trim the leads on the two resistors to about ½ inch in length.

2) Remove the cover plate from the switch and discard it. Keep the two screws. Remove the bottom plate from the box.

3) Trim all twelve of the switch wires to four inches and strip ⅛ inch of insulation off each wire. (NOTE: Eight of the wires are single wires and two are twin-lead wires.)

4) Separate the 12 switch wires into bundles as follows:
Bundle #1 Dual wire, one is blue and one is blue with a white stripe
Dual wire, one is white and one is white with a black stripe
Bundle #2 Four single wires, purple, red, orange, gray
Bundle #3 Four single wires, yellow, white, black, blue

5) Cut out template for the computer side of the box and tape it on either side of the box. Drill a hole where indicated. Hole size is marked on the template.

6) Cut out template for the device side of the box and tape it on the opposite side of the box from the computer side. Drill the two holes where indicated. Hole sizes are marked on the template.

7) Cut out the template for the top of the box and tape it in place. Drill the two holes for the LEDs first, then drill out the center and use the razor knife to square it up. Drill the two screw holes adjacent to the switch hold and countersink them. Hole sizes are marked on the template.

8) Install the switch in the box.

9) Cut one of the plug cables in half, strip two inches of the outer insulation off, then strip ⅛ inch of insulation from each of the four inner wires. (Do this to both halves of the cable.)

10) Cut the remaining cable two inches from one of the ends. Strip two inches off of the insulation on the long piece and strip ⅛ inch of insulation off each of the four inner wires. (NOTE: The short piece of cable and plug are not needed.)

11) Use the long piece of cable and slowly twist it into one of the two device holes previously drilled in the box.

12) Insert the two remaining cables into the two remaining holes in the sides of the box.

13) Solder one 100 Ohm resistor to the positive side of each of the LEDs.

14) Snap the LEDs into the holes drilled in the top of the box.

15) Turn the box upside down so the computer side is closest to you and you are looking into the box.

16) Carefully solder the following wire connections. Refer to the wiring instructions and diagram if necessary.

For The Device Cable On Your Right:

Plug Wire		LED/Resistor	Switch Wire
RED	TO:	RESISTOR AND:	RED
GREEN	TO:		GRAY
YELLOW	TO:		PURPLE
WHITE	TO:	LED LEAD AND:	ORANGE

For The Device Cable On Your Left:

Plug Wire		LED/Resistor	Switch Wire
RED	TO:	RESISTOR AND:	YELLOW
GREEN	TO:		BLUE
YELLOW	TO:		BLACK
WHITE	TO:	LED LEAD AND:	WHITE

For The Computer Side Cable

Plug Wire		Switch Wire
RED	TO:	BLUE
GREEN	TO:	BLUE WITH A WHITE STRIPE
YELLOW	TO:	WHITE WITH A BLACK STRIPE
WHITE	TO:	WHITE

(Note: These switch wires are the twin-lead wires.)

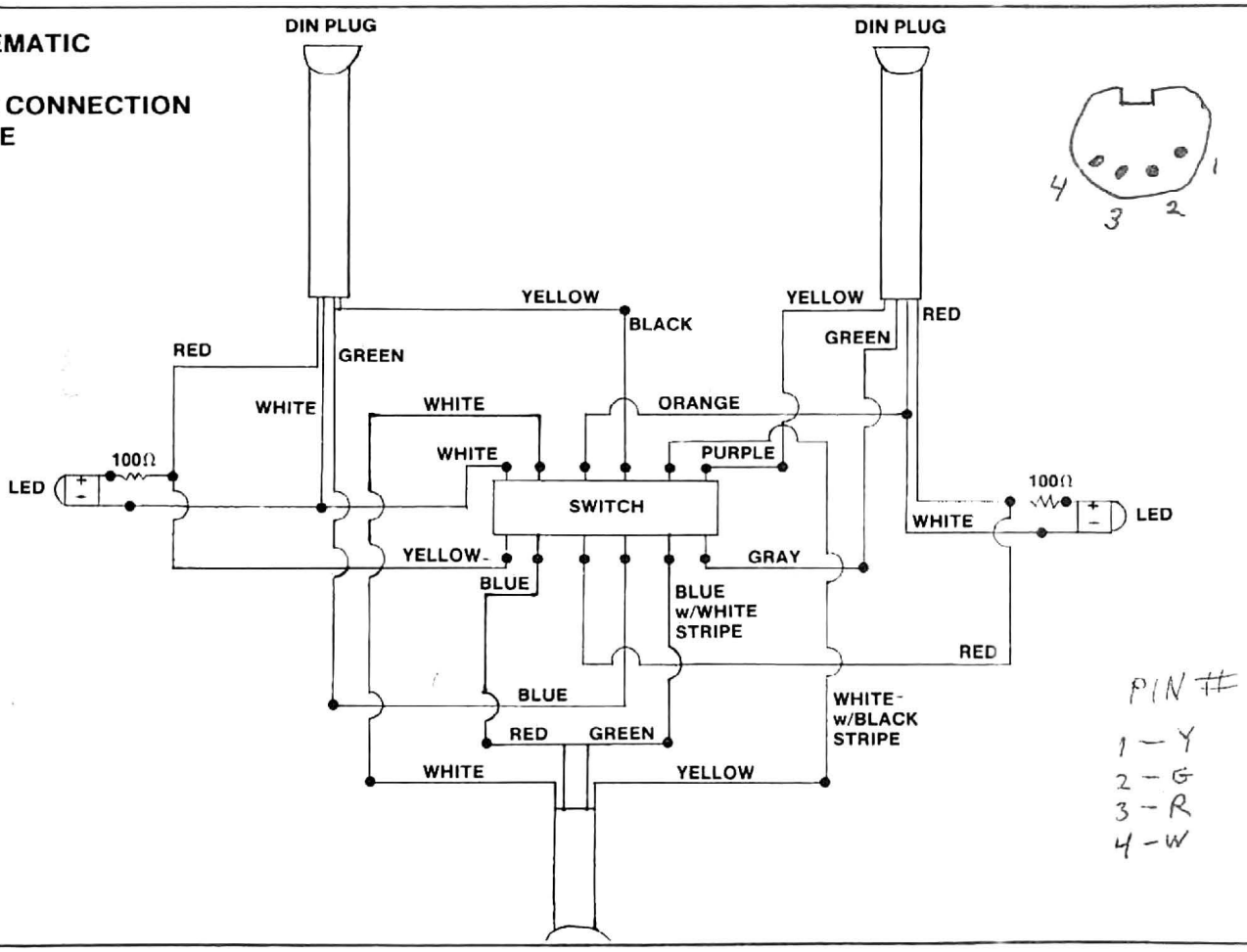
17) Double-check all of your wiring connections, then wrap a small piece of electrical tape around each. Bend the resistors down if necessary to allow the plate to be reinstalled on the bottom of the box.

18) Place small strips of electrical tape on the inside of the cover plate, then replace it on the box.

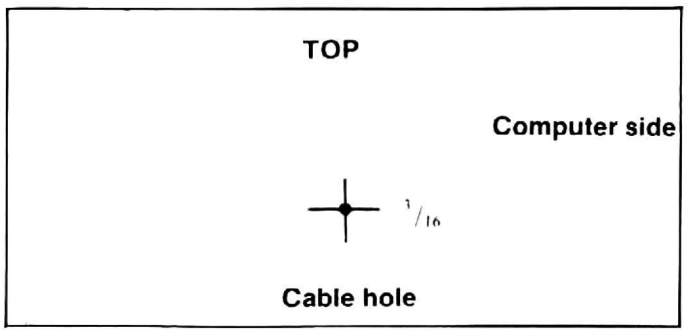
19) Carefully glue the covering template into place. Be sure that it is correctly oriented. The word "Computer" should be over the side with the single cable.

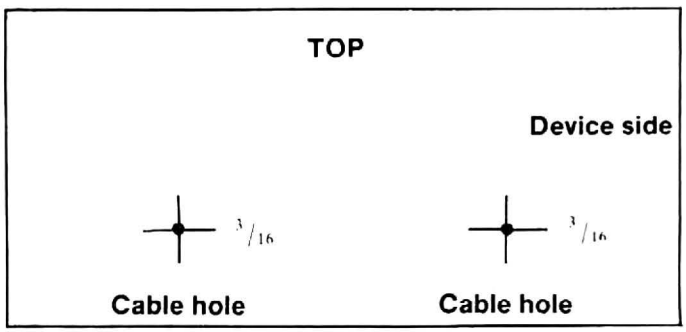
20) Install the switch and when you turn on the computer, the LED corresponding to the switch position should light up. If the switch is reversed, simply open the box and remove the switch, then reinstall it in the opposite direction.

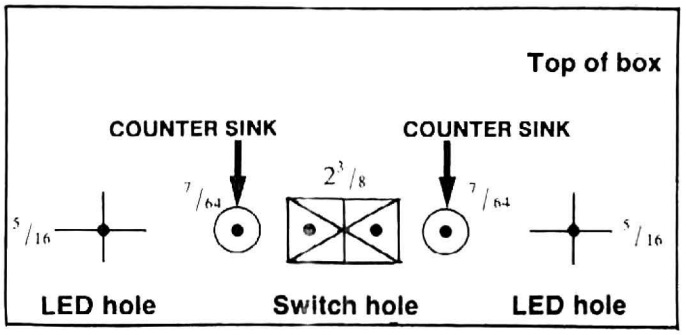
SCHEMATIC AND WIRE CONNECTION GUIDE

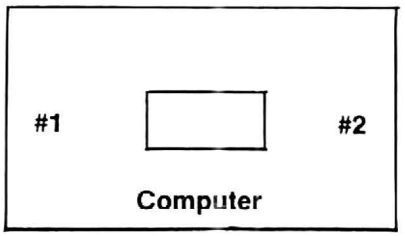


TEMPLATES









I think that you will find this to be a simple, entertaining and educational project. The modifications to add LEDs for the two remaining lines are simple and I will be happy to provide a second schematic if you will send a self-addressed, stamped envelope to David C. Owen, 2340 West University #269, Mesa, Ariz., 85201, or if you would rather purchase one, I will be happy to send you a complete switch box for $25.

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- Contractions	2
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- Plurals	3, 4
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Merry Christmas To All And To All A Good Byte



By Robert Mauro

Here's a totally animated and colorfully graphic Christmas card any computer friend would love to get. It paints a multicolored cover, plays "Deck the Halls," plants a Christmas tree, makes it grow, decorates it, and then lets it snow.

Using the *CIRCLE, LINE, PAINT, COLOR,* and *PLAY* functions of Extended BASIC, this program will really brighten the face of any child on Christmas.

So type it into your CoCo and watch the treetop glisten and the children listen as you open your Christmas gift on the morning of the 25th.

Program Breakdown

LINE#	PROGRAM NOTES
10-60	Creates Christmas card cover
70-80	Plays "Deck the Halls"
90-240	Plants tree and makes it grow
250-320	Hangs balls on tree
330-370	Hangs wreaths
380	Lays down grass
400-450	Sets flashing decoration on top of tree and creates tinkling sound
460-470	Lets it snow

120.... 017E
270.... 02B4
END....0440

The listing:

```
5 REM COPYRIGHT (C) 1983 ROBERT
A. MAURO     LAST UPDATE 5/3/83
10 CLS(8):FOR P=1 TO 510:V=V+1
20 IF V>7 THEN V=1
30 PRINT @(0+P),CHR$(143+16*V);:
NEXTP
40 PRINT@164,"MERRY CHRISTMAS TO
 ALL";
50 PRINT @238,"AND";
60 PRINT @294,"TO ALL A GOOD BYT
E";
70 A$="L4.;C;L8;B-;L4;A;G;F;G;A;
F;L8;G;A;B-;G;L4.;A;L8;G;L4;F;E;
L2;F"
80 PLAY"T5;O3;XA$;T5;O4;XA$;":CL
S
90 PMODE1,1
100 PCLS
110 SCREEN 1,1
120 X1=52:Y1=167:X2=203:Y2=167
130 LINE (X1,Y1)-(X2,Y2),PSET,BF
140 LINE(125,191)-(131,167),PSET
,BF
150 COLOR 7,4
160 LINE(121,191)-(134,183),PSET
,BF
170 COLOR 7,4
180 LINE (114,178)-(141,180),PSE
T,BF
190 LINE(118,178)-(137,182),PSET
210 PAINT(0,191),8,4
220 X1=X1+.5:Y1=Y1-1:X2=X2-.5:Y2
```

(Robert Mauro, who's company, CompuRAM, sells games and educational programs for the CoCo, is a freelance writer. Among other projects, he edits newsletters for the Long Island Center for Independent Living and the Association for Better Conditions for the Disabled—all on the Color Computer.)

CC SOFTWARE

EXTENDED BASIC not Required unless noted. Programs require a 16K Computer and are Disk Compatible.

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```
=Y2-1
230 IF Y1<15 THEN 250
240 GOTO 130
250 B=83:L=155
260 FOR PP= 1 TO 4
270 FOR YY = 1 TO 3
280 CIRCLE(B,L),10,8
290 CIRCLE(B,L),6,8
300 CIRCLE(B,L),2,8
310 B=B+45:NEXT YY
320 B=83:R=R-1:L=L-35:NEXT PP
330 WW=40:XM=80:FOR PQ = 1 TO 2
340 FOR RADIUS = 16 TO 25
350 CIRCLE (WW,XM),RADIUS,6
360 NEXT RADIUS :WW=215:XM=80
370 NEXT PQ
380 LINE(0,190)-(255,191),PSET,B
F
390 IF Y1=14 THEN 400
400 CIRCLE(126,10),4,RND(8)
410 TT=RND(255)
420 IF TT<220 THEN 410
430 SOUND TT,1
440 PSET(RND(255),RND(191),5)
450 CIRCLE(126,10),6,RND(8)
460 PSET(RND(255),RND(191),5)
470 GOTO 390
,BF
200 COLOR 6,4
```

Back Issue Availability

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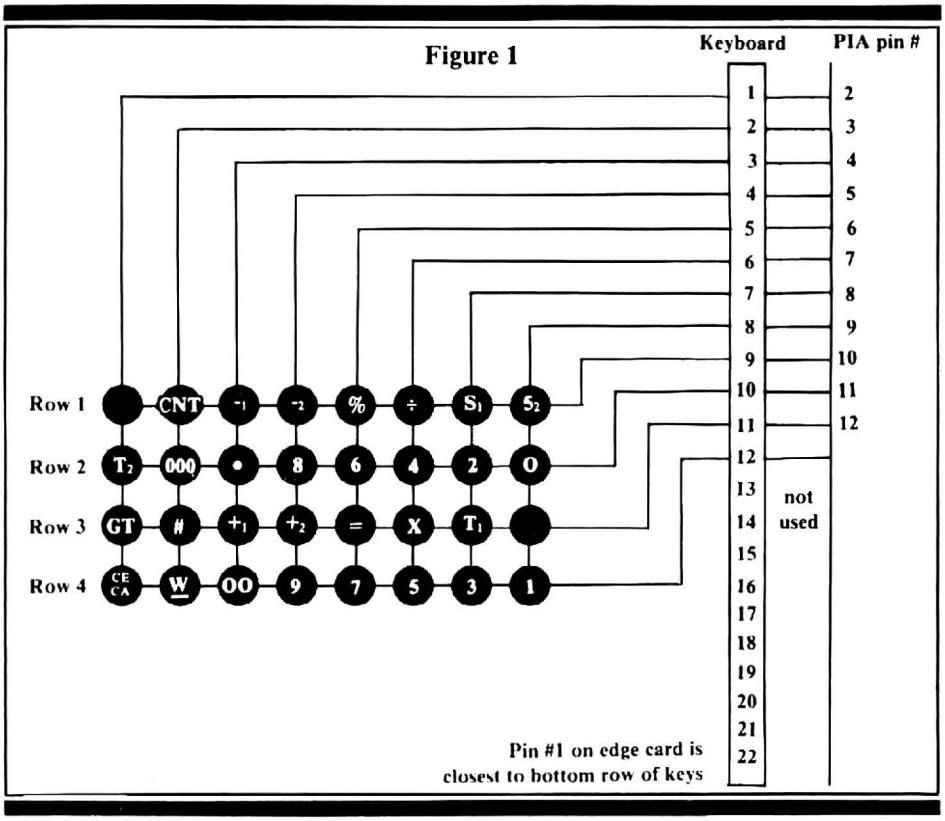
INTERFACE A CALCULATOR KEYBOARD TO THE PIA

By Dennis Meixsell

In part one of this series we built the experimenter's board and interfaced the Peripheral Interface Adaptor. In this, the second part, we will interface a calculator keyboard to the PIA, write a software driver and explain more about connecting the PIA. Let's jump right into interfacing the keyboard.

The only parts needed will be a calculator keyboard, connecting wire and solder. I used a keyboard from Jameco, part no. KB297043. It cost less than $5 and I was pleasantly surprised at how nice it looked. Here is Jameco's address if anyone needs it: Jameco Electronics, 1355 Shoreway Road, Belmont, Calif., 94002, (415) 592-8097.

The interfacing is very simple. Figure 1 shows the keyboard matrix. Simply connect the keyboard pins to the appropriate pins on the PIA. Note that the switches and the LEDs on the keyboard were not used. At this time I have no use for them, but they present a lot of future possibilities. I used a 2½' cable made of 12 wires to connect the PIA and keyboard. Solder the wires directly to the pins on the edge connector of the keyboard. On the PIA end of the cable, strip ¼" of insulation off and insert these into the solderless breadboard.



Type in the *Keybod* program and run it. The keyboard should now run like a regular calculator. The only math functions available with my program are add, subtract, divide, multiply. The CE/CA key is used to delete and rerun.

Now to explain a few points about the *Keybod* program. The main objective of the program is to demonstrate the decoding of a keyboard matrix. If you have a copy of the "Color Computer Technical Manual," look at the schematic on Page 68. The CoCo uses a very similar hardware setup for its keyboard. The software used in the CoCo is machine language and is quite different, but this BASIC program illustrates very well the process involved in decoding the keyboard. Let's look at the main question: "How do we decode 32 keys with eight inputs and four outputs?" or in the case of the Color Computer, "How do we decode 52 keys with eight outputs and eight inputs?" I'm glad you asked that question. We must first realize that each of the bits in register A are normally "1." If we *PEEK* side A of the PIA (location

(Dennis Meixsell is actively involved in the EMS system in East Peoria, Illinois, as a firefighter and is currently a student in electronic technology.)

$FF40), we see 255. All pins show a "1." By grounding any of the eight pins 2—9 (bit 0—7), we will get different numbers when we *PEEK* $FF40. By decoding this number we can know which pin was grounded. This was shown by the short test program in part one.

Here is where the four output pins on side "B" come in. Normally, we keep the four output pins equal to "1." To begin reading the PIA, make bit 0 of side B equal to "0" (ground). This is done by *POKEing* $FF42 with 254 or $FE. Now, if any button is pushed in row one, that button will connect one of the bits on side A to ground. This will show at location $FF40. To read the second row, make bit 0 equal to "1" and make bit 1 equal to "0" (ground). This will read row two. Next, make bit 2 equal to ground. Then make bit 3 equal to ground. Repeat this until an input is found. Then the program must jump to a decoding section. This is where the computer decodes which key was pressed, in which row it was pressed and then responds accordingly.

The program is fairly straightforward and you should have no problem following it. Notice that I used Y$ for input. This is to assist in formatting to the screen. I wanted the numbers to move right or left from the decimal point, so I made the input a string to allow me to manipulate its printing format. If functions other than the add, subtract, divide or multiply are desired, then they can very easily be added. The keys may be covered with a new label. When the program sees that key pressed, have it perform the new function on X and val(Y$). If anyone comes up with a great program, be sure to send me a copy on cassette.

Figures 2 and 3 show the pin designation for the side port on the CoCo and the pins on the PIA. This will not answer all of your questions, but it will give you some idea as to

Figure 2

Color Computer's Cartridge Port

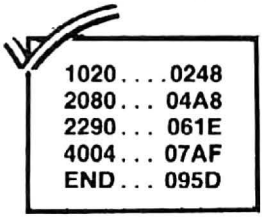
PIN#	DESCRIPTION
1	-12 volts (100 MA) * do not exceed maximum current
2	+12 volts (300 MA)
3	HALT input to CPU
4	NMI non maskable interrupt to CPU
5	RESET from CPU
6	E main CPU clock
7	Q clock which leads E
8	.CART detects presence of cartridge
9	+5 volts (300 MA)
10	D0 CPU bit 0
11	D1 CPU bit 1
12	D2 CPU bit 2
13	D3 CPU bit 3
14	D4 CPU bit 4
15	D5 CPU bit 5
16	D6 CPU bit 6
17	D7 CPU bit 7
18	R/W CPU read-write signal
19	A0 CPU address bit 0
20	A1 CPU address bit 1
21	A2 CPU address bit 2
22	A3 CPU address bit 3
23	A4 CPU address bit 4
24	A5 CPU address bit 5
25	A6 CPU address bit 6
26	A7 CPU address bit 7
27	A8 CPU address bit 8
28	A9 CPU address bit 9
29	A10 CPU address bit 10
30	A11 CPU address bit 11
31	A12 CPU address bit 12
32	CTS cartridge select signal-decodes addresses $C000-$FFEF
33	GND signal ground
34	GND signal ground
35	SND sound input from cartridge
36	SCS selects addresses $FF40-$FF5F
37	A13 CPU address bit 13
38	A14 CPU address bit 14
39	A15 CPU address bit 15
40	SLENB disables the internal device selection

Figure 3

Pia Pin Designation

1	Vss-ground
2	PA0-output reg. A, bit 0
3	PA1-output reg. A, bit 1
4	PA2-output reg. A, bit 2
5	PA3-output reg. A, bit 3
6	PA4-output reg. A, bit 4
7	PA5-output reg. A, bit 5
8	PA6-output reg. A, bit 6
9	PA7-output reg. A, bit 7
10	PB0-output reg. B, bit 0
11	PB1-output reg. B, bit 1
12	PB2-output reg. B, bit 2
13	PB3-output reg. B, bit 3
14	PB4-output reg. B, bit 4
15	PB5-output reg. B, bit 5
16	PB6-output reg. B, bit 6
17	PB7-output reg. B, bit 7
18	CB1-control interface line
19	CB2-control interface line
20	Vcc-+5 volts
21	R/W-read and write
22	CS0-chip select (decodes PIA addresses)
23	CS2-chip select
24	CS1-chip select
25	E-from main computer clock
26	D7-data bit 7 (computer data buss)
27	D6-data bit 6
28	D5-data bit 5
29	D4-data bit 4
30	D3-data bit 3
31	D2-data bit 2
32	D1-data bit 1
33	D0-data bit 0
34	RESET-reset from CPU
35	RS1-selects side A or B
36	RS0-selects which reg.
37	IRQB-interrupt reg. B
38	IRQA-interrupt reg. A
39	CA2-control interface line
40	CA1-control interface line

what is what. This should give you something to keep you busy.



The listing:

```
1 '**********************
2 '*                    *
3 '* CACULATOR DRIVER   *
4 '*                    *
5 '**********************
6 CLS
9 PRINT"* * * C A L C U L A T O
R * * *";
50 'SET VARIABLES
60 A=&HFF40 'LOCATION OF PIA SID
E A
61 B=&HFF42 'LOCATION OF PIA SID
E B
100 'INITILIZE PIA
110 POKE A+1,00 'SELECT DDRA
120 POKE A,00 ' SET ALL BITS FOR
 INPUT
130 POKE A+1,04 'SELECT ORA
140 POKE B+1,00 'SELECT DDRB
150 POKE B,255 'SELECT ALL BITS
AS OUTPUTS
160 POKE B+1,04 'SELECT ORA
1000 ' INPUT READ
1010 POKE B,&HFE 'READ ROW #1
1020 KEY=255-PEEK(A) 'CONVERT IT
 FOR EASIER UNDERSTANDING
1030 IF KEY<>0THEN ROW=1: GOTO 2
000 'IF INPUT GOT DECODE
1100 POKE B,&HFD 'READ ROW #2
1120 KEY=255-PEEK(A)
1130 IF KEY<>0THEN ROW=2:GOTO 20
00
1200 POKE B,&HFB 'READ ROW #3
1220 KEY=255-PEEK(A)
1230 IF KEY<>0 THEN ROW=3:GOTO20
00
1300 POKE B, &HF7 'READ ROW #4
1320 KEY=255-PEEK(A)
1330 IF KEY<>0 THEN ROW=4:GOTO20
00
1400 F=0 'USED TO STOP KEY REPEA
T
1900 GOTO 1000
2000 'DECODE*****************
2001 IF F=ROW+KEY THEN GOTO 1000
 'MAKE SURE LAST KEY IS RELEASED
2002 F=ROW+KEY 'REMEMBER LAST KE
Y
2009 SOUND 1,1
2010 IF ROW=2 GOTO 2100
2011 IF ROW=3 GOTO 2200
2012 IF ROW=4 GOTO 2300
2020 IF KEY=4 THEN O$="-":GOTO 3
000
2030 IF KEY=8THEN O$="-":GOTO 30
00
2050 IF KEY=32 THEN O$="/":GOTO
3000
2080 GOTO1000
2100 'ROW #2*********************
2120 IF KEY=2 THEN Y$=Y$+"000"
2130 IF KEY=4 THEN Y$=Y$+"."
2140 IF KEY=8 THEN Y$=Y$+"8"
2150 IF KEY=16 THEN Y$=Y$+"6"
2160 IF KEY=32 THEN Y$=Y$+"4"
2170 IF KEY=64 THEN Y$=Y$+"2"
2180 IF KEY=128 THEN Y$=Y$+"0"
2190 GOTO 4000
2200 'ROW#3**********************
2230 IF KEY=4 THEN O$="+":GOTO30
00
2240 IF KEY=8 THEN O$="+":GOTO30
00
2250 IF KEY=16 THEN GOTO 5000
2260 IF KEY=32 THEN O$="*":GOTO
3000
2290 GOTO 1000
2300 'ROW#4**********************
```


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```
2310 IF KEY=1 THEN IF Y$=""THEN
RUN ELSE Y$=LEFT$(Y$,LEN(Y$)-1):
GOTO 4000
2330 IF KEY=4THEN Y$=Y$+"00"
2340 IF KEY=8THEN Y$=Y$+"9"
2350 IF KEY=16THENY$=Y$+"7"
2360 IF KEY=32THENY$=Y$+"5"
2370 IF KEY=64THENY$=Y$+"3"
2380 IFKEY=128THENY$=Y$+"1"
2390 GOTO 4000
3000 'OPERATERS  + - * /
3010 IF X<>0 THEN GOTO 6000
3020 IF X=0 THEN X=VAL(Y$):Y$=""
3080 PRINT @161,O$:PRINT @162-LE
N(Y$),Y$
3099 GOTO 1000
4000 'NUMBER INPUT ROUTINE******
*
4004 GOTO 4010
4010 IF X=0 THEN GOSUB 4100:PRIN
T @ 143-LN," ";Y$
4020 IF X<>0 THEN GOSUB 4100:PRI
NT@ 175-LN," ";Y$
4030 GOTO 1000
4100 FOR C= 1 TO LEN(Y$)
4110 IF MID$(Y$,C,1)="." THEN LN
 = C: RETURN
4120 NEXT
4130 LN =C:RETURN
5000 'OPERATION  -FINAL CACULATI
ON
5010 IF O$="+" THEN Z=X+VAL(Y$)
5020 IF O$="-" THEN Z=X-VAL(Y$)
5030 IF O$="*"THEN Z=X*VAL(Y$)
5040 IF O$="/"THEN Z=X/VAL(Y$)
5075 PRINT @193,STRING$(30,"-")
5080 PRINT @225,"= ";
5090 PRINT USING "############,.#
###";Z
5099 X=0:Y$="":Z=0:GOTO1000
6000 'DUPLICATE SIGN************
*
6010 STOP
```


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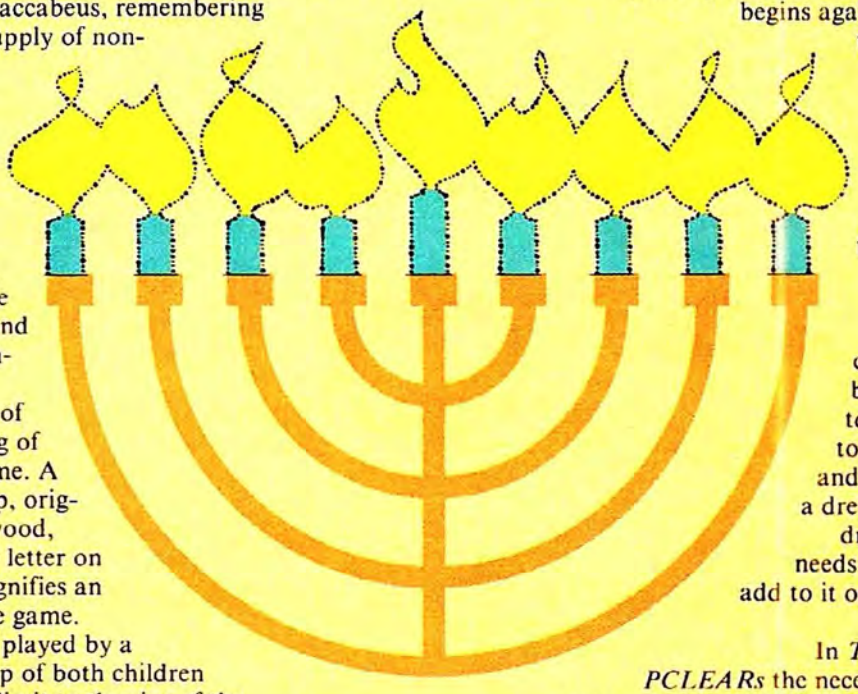
DEALER INQUIRY INVITED

A HANUKKAH GIFT FOR YOU

By Stephanie and Bill Snyder

The joyous sounds of excited children receiving brightly wrapped gifts and playing games fills the air. The aroma of Latkes (potato pancakes) and other special holiday foods filters through the house, as the holiday of Hanukkah, the Festival of Lights, is celebrated by Jewish people the world over.

Hanukkah is a Jewish observance which celebrates the rededication of the Second Temple of Jerusalem in 165 BC, after its destruction three years earlier, by a Syrian king. Modern Jews tend to emphasize the military victory of Judas Maccabeus, remembering how a small, one-day supply of non-desecrated oil miraculously burned for eight full days until new oil could be obtained. The ceremony is distinguished by the lighting of a multi-branched candelabrum. One candle is lighted the first day, two the next and so on, until all eight candles are burning.



One of the traditions of Hanukkah is the playing of the dreidl (dray-del) game. A dreidl is a four-sided top, originally made of clay or wood, with a different Hebrew letter on each side. Each letter signifies an action to be taken in the game.

The game of dreidl is played by a group of people made up of both children and adults. There is no limit to the size of the group and, of course, the more, the merrier. Each person has a "stake" made up of coins, buttons, nuts, raisins, or anything else you can think of. At the beginning of a game, each player puts two things into the pishka, or pot. After a lot of arguing over who goes first (usually the youngest, who is crying the loudest!), the player whose turn it is spins the dreidl. Depending on the letter that the dreidl lands on, one of four possible actions are taken. If the dreidl lands on the gimmel, ג , that player takes everything that is in the pishka. If it lands on nun, נ , the player does nothing that round. He neither adds to nor takes anything from the pot. If it lands on hay , ה , the player takes half of what is in the pishka and if the dreidl lands on shin, ש , the player adds two. It is then the next player's turn. In the event that one player spins a gimmel and wins everything, the game begins again with the next person's turn and everyone has to put two things into the pishka. The game ends when everyone decides that they don't want to play anymore. The winner is the person with the most money or buttons, etc. Traditions, even long-standing ones, can be changed or new ones can be created. It is now time to add another dimension to the Hanukkah tradition and make the computer into a dreidl. In this version of the dreidl game, everyone still needs their own stake and will add to it or take from it depending on the dreidl's spin.

In *The Dreidl Game* Line 10 *PCLEARs* the necessary graphic screens. If you make any modifications, this line must still be the first line of the program.

Line 100 insures that the dreidl's spin is truly random. If you are a constant winner, nobody can accuse you of "fixing" the game. You can simply claim Divine assistance!

Lines 110 through 430 with a *GOSUB* to 560 draw the

graphics screens. Those lines include explanations of the Hebrew letters and the actions to be taken. If you do not want to see the Hebrew letters or explanations before the game begins, you can delete the following lines: 90; 160 through 180; 240 through 260; 320 through 340; and 400 through 420. On Line 560, you should then delete SCREEN1,0:.

Lines 460 through 490 allow you to set the number of players and *INPUT* their names. Try to keep the names within seven characters. The "name array," N$, is dimensioned by the number of players, P, so that any number of people can play.

Lines 580 through 660 are a subroutine that spins the dreidl and Lines 670 and 680 are a subroutine that is used when a person spins a gimmel and has won everything in the pishka.

To advance the game, you can hit any key, except the [BREAK].

There are many ways to draw high-resolution graphics on the CoCo. In this program, *DRAW* statements were used throughout to create the dreidl, the Hebrew letters and the instructions because they were found to be the most efficient.

During the writing of *The Dreidle Game,* our memories brought us back to our childhood and reminded us of a very successful advertising campaign waged in the New York area. It was an ad depicting a young Oriental child enjoying a sandwich made with "Levy's Real Jewish Rye" bread. The accompanying message read, "You don't have to be Jewish to enjoy Levy's." We feel the same way about *The Dreidl Game.* We hope it will add fun to *your* holiday season!



170..... 0274
310.....04C4
450..... 0758
END ...0A42

The listing:

```
10 PCLEAR8
20 REM **************************
30 REM *     THE DREIDL GAME     *
40 REM *           BY            *
50 REM *     STEPHANIE SNYDER    *
60 REM *        9/15/83          *
70 REM **************************
80 CLS(8): PRINT@200, "THE DREID
L GAME";: PRINT@458,"HIT ANY KEY
";
90 IF INKEY$="" THEN 90
100 M=RND(-TIMER)
110 FOR D=1 TO 4:ON D GOTO 120,2
00,280,360
120 PMODE 1,1
130 GOSUB 560
140 DRAW "BM144,60;R16D68R28U68L
16BR28R16D68L28"
150 DRAW "BM16,112;U12R8D4L8BR12
BU4D12R8U12BR4R8BL4D12BR16BU12R8
D4L8D8R8BR12BU12D12BR4U12F12U12
160 IF INKEY$="" THEN 160
170 CLS(3):PRINT@136, "THIS IS A
 SHIN...";:PRINT@198,"EVERYTIME
IT APPEARS";:PRINT@228,"YOU PUT
2 INTO THE PISHKA";:PRINT@458,"H
IT ANY KEY";
180 IF INKEY$="" THEN 180
190 GOTO 430
200 PMODE 1,3
210 GOSUB 560
220 DRAW "BM144,60;R68D68BL52U60
"
230 DRAW "BM12,100;R8BL4D12BR8U1
2R8D12BU8L8BR12BU4D12BU6E6B06F6B
R4U12R8BD4L8BD8R8BR12U12BD4R8BU4
```

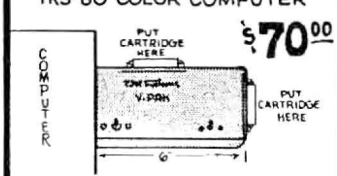

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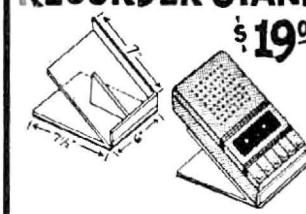
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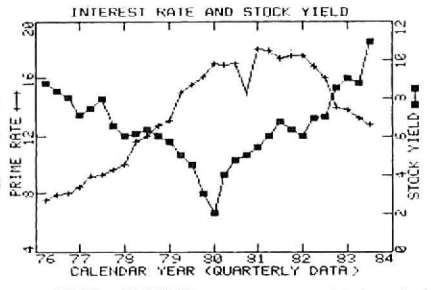
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(Stephanie Snyder is a former early childhood teacher and a published programmer. She currently is pursuing a second degree in computer sciences. Bill, in his free time, writes articles for several publications.)

```
D12BR4U12R8D12BL8BU8R8BR4BU4D12R
8BR4U12R8BD4L8"
240 IF INKEY$="" THEN 240
250 CLS(4):PRINT@136, "THIS IS A
 HAY...";:PRINT@198,"EVERYTIME I
T APPEARS";:PRINT@230,"  YOU TAK
E HALF OF  ";:PRINT@262,"WHAT'S
IN THE PISHKA";:PRINT@458,"HIT A
NY KEY";
260 IF INKEY$="" THEN 260
270 GOTO 430
280 PMODE 1,5
290 GOSUB 560
300 DRAW "BM180,60;R24D68BU20L40
D20"
310 DRAW "BM12,100;R8BL4D12BR8U1
2R8D12BU8L8BR12BU4D12BU6E6BG6F6B
R4U12R8BD4L8BD8R8BR12U12R8D12BU8
L8BR12BU4D12R8BR4BU12D12R8"
320 IF INKEY$="" THEN 320
330 CLS(1):PRINT@134,"THIS IS A
GIMMEL....";:PRINT@198,"EVERYTIM
E IT APPEARS";:PRINT@230,"YOU TA
KE EVERYTHING ";:PRINT@262,"  F
ROM THE PISHKA  ";:PRINT@458,"HI
T ANY KEY";
340 IF INKEY$="" THEN 340
350 GOTO 430
360 PMODE 1,7
```


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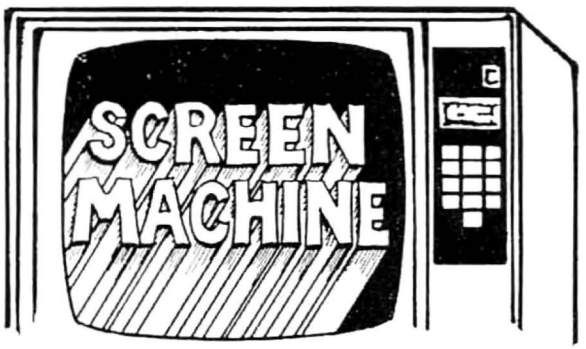
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GRAFPLOT is available for 16K E.C.B. ($35.00) and 32K E.C.B. ($40.00) on cassette and for 32K disk ($45.00) (U.S.). Send check or money order to: HAWKES RESEARCH SERVICES, 1442 Sixth St., Berkeley, CA, 94710. Manual available separately for $10.00 + shipping, refundable with purchase. Include $3.00 shipping on all orders. Dealer (30-50%) and club discounts (20-40%) available. VERSION 1.0 OWNERS- $3.00 FOR EXCHANGE.


```
370 GOSUB 560
380 DRAW "BM160,60;R48D64L36"
390 DRAW "BM12,100;D12R4E4U4H4L4
BR12D12R8U12L8BR20BD12U12F12U12B
R4R8D12L8U12BR12R8BL4D12BR8U12BR
8D12BU8L8BR12BU4D12BR4U12F12U12B
R4D12R8U4L4BU8BR4L8"
400 IF INKEY$="" THEN 400
410 CLS(7):PRINT@136,"THIS IS A
NUN...";:PRINT@198,"EVERYTIME IT
 APPEARS";:PRINT@233,"YOU DO NOT
HING!";:PRINT@458,"HIT ANY KEY";
420 IF INKEY$="" THEN 420
430 NEXTD
440 CLS(8):PRINT@135,"T O    B E
 G I N";:PRINT@192,"EVERYBODY PU
T 2 INTO THE PISHKA":PRINT@458,"
HIT ANY KEY";
450 IF INKEY$="" THEN 450
460 CLS(5):PRINT@197,"HOW MANY P
LAYERS ";:INPUT P
470 IF P=0 GOTO 460
480 DIM N$(P)
490 CLS:FOR X= 1 TO P:PRINT "WHO
 IS PLAYER #";X;:INPUT N$(X):PRI
NT"":NEXT X
500 P1=1
510 IF P1>P THEN P1=1
520 CLS(5):PRINT@133, "IT'S YOUR
 TURN, "N$(P1);:PRINT@259,"PRESS
 S TO SPIN THE DREIDL";:PRINT@29
8,"OR E TO END";
530 K$=INKEY$:IF K$="E" GOTO 540
 ELSE IF K$="S" GOTO 580 ELSE GO
TO 530
540 CLS:PRINT "THE END"
550 END
560 COLOR 4,2:PCLS:SCREEN 1,0:LI
NE (180,12)-(184,44),PSET,BF
570 DRAW "BM136,44;R92D88G48H48U
88":RETURN
580 X=1:FOR Z=1 TO RND(25)+15
590 PMODE1,X:SCREEN1,0:FOR Y=1 T
O 30:NEXTY:SOUND Z+150,1
600 X=X+2:IF X>7 THEN X=1
610 NEXT Z
620 P1=P1+1
630 IF X=7 THEN 650
640 IF INKEY$="" THEN 640 ELSE 5
10
650 IF INKEY$="" THEN 650
660 FOR S=100 TO 250 STEP 20:SOU
ND S,1:NEXT S
670 CLS(8):PRINT@194, "YOU WON E
VERYTHING, "N$(P1-1)"!!!";:PRIN
T@288,"EVERYBODY PUT 2 INTO THE
PISHKA":PRINT@458,"HIT ANY KEY";
680 IF INKEY$="" THEN 680 ELSE 5
10
```

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Lazy Man's Disk Directory

By Ralph Delperdang

I have a 32K CoCo with a Radio Shack disk drive. It is a great system, but, as anyone who has one knows, the disk directory is unacceptable. If you have more than 14 files, you have to be fast on the [SHIFT] and @ keys. Being basically lazy, (If I wasn't lazy, why would I need a computer to do my work for me?) I wrote a program that will list up to 30 files on the screen at once.

Another problem with TRSDOS is it doesn't allow you to label your disks. My program fixes that too, and prints out the number of free grans on the disk.

To run the program, insert a disk with the program on it and type RUN"D (I named the program *D/BAS* to save keystrokes loading it. Lazy, remember?). The top line prints the name you give your disk in program Line 40 and prints the number of free grans. Next, the program lists and numbers the files that are on the disk. Finally, the last line asks you to "SELECT A PROGRAM?" If you type the number next to a program and [ENTER], the computer will run that program. (That is a lot less keystrokes than typing *RUN*, the filename, and the extension.) I said this program will display 30 filenames at once, but if there are more than 28, the name of the disk and number of free grans will scroll off the screen.

Line Descriptions

Line 10 clears space for the filenames.

Line 20 sets up the array for the filenames. If you have more files on the disk than the first number in the *DIM* statement (35 in my program), you will get a BS (subscript out of range) Error.

Line 40 names the disk.

Lines 50 to 180 get the filenames from track 17 on the disk and load them into the array. (This routine was inspired by Michael Plog's *Print Directory* program in the March '83 *Rainbow.)*

Line 160 allows me to selectively delete files from my directory by the extension name. In my case, my directory will not list any files with the extension "DAT." (I can't *RUN* a data file, so I don't list them.)

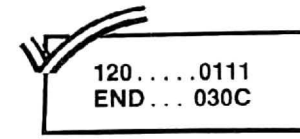
Lines 190 to 210 print the filenames on the screen.

Lines 215 to 240 allow you to select a program. I used "PRINT @ LCN" to prevent the list of filenames from scrolling off the screen if I enter an invalid number.

Line 250 runs the selected program. I tried using RUN PROG$, but it didn't work.

(Ralph Delperdang is a captain in the U.S. Air Force and currently flies the RE-4 Phantom. He has an engineering degree from Iowa State University. His hobbies include the computer and he is working on making his children (and wife) computer literate.)

The listing:




```
1 'D/BAS
10 CLEAR1000
20 DIMP$(35,2)
30 CLS
40 PRINT"DISK#1 RAINBOW 830815 :
";FREE(0);"FREE"
50 FORZ=3TO11
60 DSKI$0,17,Z,A$,B$
70 X$=A$:GOSUB110
80 X$=B$:GOSUB110
90 NEXTZ
100 GOTO190
110 FORJ=1TO128STEP32
120 R=R+1
130 P$(R,1)=MID$(X$,J,8)
140 IFLEFT$(P$(R,1),1)=CHR$(255)
THENR=R-1:GOTO190
145 IFLEFT$(P$(R,1),1)=CHR$(0)TH
ENR=R-1:GOTO170
150 P$(R,2)=MID$(X$,J+8,3)
160 IFP$(R,2)="DAT"THENR=R-1
170 NEXTJ
180 RETURN
190 FORK=1TOR
200 PRINTUSING"##";K;:PRINT")";P
$(K,1);"/";P$(K,2),
205 IFK=R THENPRINT,
210 NEXTK
215 LCN=480
220 PRINT@LCN,"SELECT A PROGRAM"
;:INPUTP
230 IFP<1ORP>R THENLCN=448:GOTO2
20
240 PROG$=P$(P,1)+"/"+P$(P,2)
250 LOADPROG$,R
```



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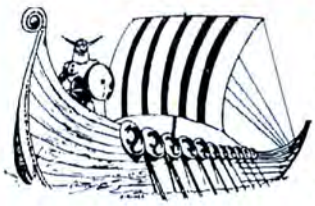


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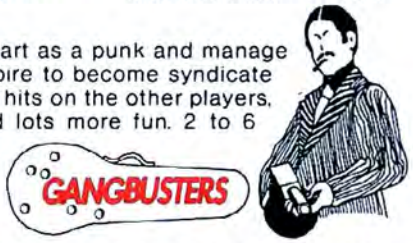
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(These are not games)

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MONSTERS & MAGIC: Fight your way thru up to 50 different monsters using a realistic fantasy combat system (initiative - damage by weapon type - levels - etc.), and then try to defeat the dungeon lord. 1000+ place description combinations. For 1 player, needs 32K. BASIC. **Tape - $19.95, Disk - $24.95**



JUNGLE: Take a journey into trouble. This game gives Murphy's law new meaning, and in this magical jungle, many things are only illusions. A very nice game, and easy enough for the younger set. BASIC. **Tape - $19.95, Disk - $24.95**

ADULT GAMES

THE NAKED GAMER: Nothing obscene - just two great games in which the losers are told to remove items of clothing. One game is a fast moving joystick type, while the other is a logic game. These games are terrific even if you keep your clothes on! B & ML. **Tape - $21.95, Disk - $26.95**

UTILITIES

COLORKIT: What can we say about the absolute best state-of-the-art programmer's utility. This program adds 35 commands to BASIC that should have been there all along and no short description will do it justice. Summary - light or dark screen, keyclick, screen editor, programable keys, a super memory tool, variable listing, echo to printer, BREAK disable, convert machine language to DATA, global search, single step thru program run, double space printouts of program listings - that's less than half of what it will do. It takes about 6K of space, and if you have 64K you can put it up high and lose no BASIC space at all. 100% ML. Fully relocatable. **Tape - $34.95, Disk - $39.95**



APPLICATIONS

PRICKLY-PEAR MAILING LIST: This mailing list program will handle up to 1500 records per file and will sort by name or zip code. It searches on any field and all display is in a hi-res upper and lower case format. There is no better mail list program. Needs 32K and 1 disk drive. B & ML. **$49.95**

MUSIC BOX: Compose your music in 4 voices and let the harmony flow. You can assign any of 4 instruments to each voice, and the program is truly easy to use. 100% ML. **Tape - $24.95**

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EXPLANATION OF CODES

BASIC: This program is 100% BASIC. That means it is easy to examine and easy to modify. BASIC is the best language for some applications.

B & ML This program is written mostly in BASIC, but some routines are in machine language for more speed. May be harder to examine or modify than an all BASIC program.

100% ML This program is all machine language for fastest possible execution. Examination or modification will require a high skill level.

EDUCATIONAL PROGRAMS

PREREAD I, II, & III: This program uses graphics and voice from the tape to teach the alphabet three ways - by name, by sound, and by shape. B & ML. **Tape - $24.95, Disk (with voice tapes) - $29.95**

PHONICS I: Teaches all the consonant blends phonetically, using graphics and sound from the tape. B & ML. **Tape - $24.95**

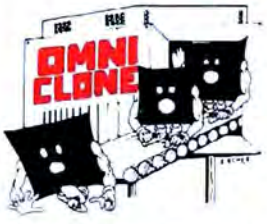
PHONICS II: Like Phonics I, but teaches the consonant digraphs. B & ML. **Tape - $24.95**

PHONICS I & II ON DISK: A package that includes both of the above in a disk format. Still has voice on tape. B & ML. **Disk only (with voice tapes) - $44.95**

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DISK ZAPPER: A neat utility that lets you easily examine and change data right on the disk! Rebuild directories, format to 40 tracks, change programs, store backup directories, and more. Needs two drives and 64K for some functions. B & ML. **$34.95**

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Copyrighting Your Software
Part 4

By Tom Nelson
***Rainbow* Contributing Editor**

The Merry Christmas season is upon us happy consumers. After this last article devoted to copyright question, I will begin a series devoted to helping the consumer. Just in time for the post-Christmas season.

This last article in the series on copyrighting your software will be devoted to helping you many software authors understand the mechanics of assigning or licensing your software. Maybe after this article some of that fine print will be more intelligible.

If you decide to have someone or some firm other than yourself market your software, there are two alternatives. You can either assign your rights in your software to the company, or you can license some or all of your rights in your software.

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Assignments and licenses also usually differ in the method of compensation. Assignments are usually obtained for a lump-sum payment, or a few installment payments. Licenses are usually granted for a certain percentage of the receipts for software sales or sub-licensing (the person licensing the program licenses his rights to another person), that is, royalties. Of course, assignments can be made for a determined sum to be paid out of receipts from the sale of sub-licensing of the software. These payments are often termed commissions rather than royalties. Licenses can also be granted for one lump-sum payment. This is frequently done in the computer industry.

The real difference between assignments and licenses, then, is the degree of control which the author retains. License agreements almost always contain certain restrictions in use, sale or sub-licensing of the program; assignment agreements rarely do.

So which should it be? The decision is partly yours. The considerations on your part, as always, are financial. Do you need a lump of money right now, or can make do with the advance on royalties offered and wait for the quarterly royalty check? Of course, the potential marketer of your software also will have a say. Obtaining an assignment of your software is costly, and the risk of your software being a flop will rest on the software house. Few software houses are willing to take such a risk in the volatile and unpredictable software market. Sure, they will own the rights to your software, but those rights may end up being worth far less than the lump-sum payment.

As a result, assignments are a rarity with outside programmers. (By contrast, employment contracts with in-house programmers will always contain assignment clauses, since the company paid for the development of the software already.) As in the book publishing industry, software houses prefer to have the author share the risk. The software house will usually provide an advance on royalties, depending on the potential of the program. This is a non-refundable payment which serves as initial compensation for and recognition of the work the author has expended to create the program. Any remaining payments will be based on sales. If the program sells well, both the author and the software house will reap the rewards; if the program flops, both will be lucky to recover the costs of creation and promotion.

Before going on to discuss the guts of assignment and license agreements, it would probably not hurt to discuss

---

*(Tom Nelson was formerly a special assistant attorney general for the State of Minnesota. He currently is general counsel for Softlaw Corporation, makers of the **VIP Library**™, and of **ColorQuest**™ games.)*

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some basic economics of marketing software. First, the author's point of view.

Program development can take anywhere from a month or so to several years. As the market becomes more sophisticated, the development time increases, since the features expected by the consuming public grow in quantity and quality. Development costs include the amount of effort devoted to the particular piece of software and the price of the developmental tools used to create it. Another important cost is any opportunity lost because of the effort used to develop your software. Based on these costs you've taken the risk, you have an idea of what it cost, and you hope to obtain a certain return on your risk "capital," be it 10 percent or 1000 percent.

Software houses incur marketing costs immediately. In fact, depending on the program, these initial marketing costs can be quite substantial. Let's look at the marketing of a good game. Games sell best when advertised with four-color, full-page ads. The cost to run such an ad in one magazine can run from a rock bottom of $500 in a not-so-desirable magazine to perhaps $2,500—and this is magazines for the Color Computer. Magazines for other computers are even more expensive, some even going up to $10,000 per page per month. The cost of ad space generally depends upon the circulation figures.

That's just the advertising monthly rate for only one of the several magazines the software house may have to use. To get an ad with the four colors is another substantial initial investment. First there's the painting, then the separations, then the typesetting, layout, color key, transparencies—soon you've spent $1,000 or more before anyone has even seen the ad. And to be successful, there usually is some media hype and enticements to dealers. Tack on to this the advance for the author, and the costs, just to get the game off the ground, are around $5,000.

Of course, not all new software gets such expensive treatment, but all authors should carefully consider such costs when dealing with a software house, and be prepared to discuss promotion. These costs will affect both the rate of royalties and the size of any advance.

Assignment agreements are usually very simple. "I'm giving you this for $X," period. They can get more complicated if there are commissions, and they usually include standard clauses which differ little from those in license agreements.

License agreements. Oh boy! I've got a million of 'em. Since I discussed general contract structure in a previous column, here we only need to discuss those terms customary to a license agreement.

First things first. What are you giving up? The right to market and adapt your software? Only the right to market? Only for one computer? For all time? For two months? The questions of the coverage and duration of your license are areas for negotiation. There is no stock formula, although software houses are only willing to bargain within certain limits. Most software houses want exclusive rights for at least one computer, and often want the right to adapt for other computers. The duration varies, but usually is not less than three years for games and five years for utilities. The difference is due to the shorter "lifespan" for games in the marketplace.

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Next, the financial terms. Any advance and the exact royalty rate must be worked out. In addition to the considerations discussed above, other elements enter in. Newer software houses which are less well known generally will be willing to offer higher royalties. More established houses which can virtually guarantee a dealer network and a well-known name tend to offer lower royalties. Sad to say, original games, which sell less well, fetch lower royalties than "knock offs." Thus, royalties vary from six percent or lower to up to 25 percent or more. The general rate, however, is between 10 and 20 percent, with the exact amount depending on the type of program. (Compare this to the standard six percent for the book publishing industry.)

But what is a royalty rate? Twenty-five percent for one company may be equal to 10 percent for another, since each may apply the percentage to a different figure. It is how the royalty rate is determined which should really concern you. A very well-known manufacturer of another computer uses the following clause in its license agreement for computing royalties as a percentage of the "net receipts:"

> For the purpose of computing royalty payments under paragraph two, "net receipts" shall mean the base price received by the company for the software. The base price of the software does not include the cost of diskettes, cassettes, cartridges or other media ("Media"), handling, production costs, packaging, documentation, promotion, taxes or duties. Refunds allowed by the company to customers upon returns of Media (containing the software) will be deducted in determining "net receipts." If Media containing the software is marketed as a package with other programs, new receipts will be allocated by the company on a pro rata basis among the programs in the package based on the bare price of each of the programs.

This type of royalty computation formula is fairly common. Royalties are computed not on gross receipts, but on net receipts, determined by subtracting certain costs. So get out your pencil and paper (or VIP Calc) and calculate exactly how much you will be getting for each copy sold. Don't forget also that you want to get royalty payments fairly frequently, say quarterly.

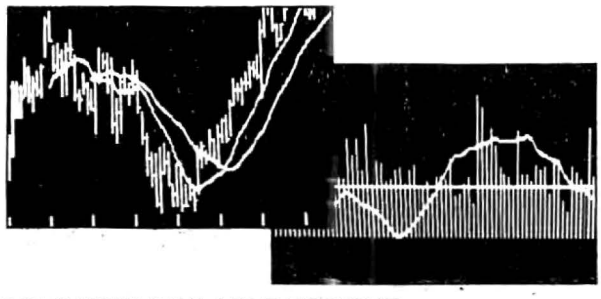
Once you have the money portion determined, don't forget to include a clause allowing you to have an accountant inspect the books for discrepancies, such as:

> I have the right to have the payment calculations verified once a year, at my expense. Verification shall consist of examination of pertinent records by a certified public accountant of my choice and approved by the company who must execute a confidential disclosure agreement provided by the company and who may not disclose any information to me other than his opinion as to the accuracy of the payments.

This clause protects both your interest in assuring accurate payments and the software house's interest in maintaining the confidentiality of its financial information.

Beyond the financial terms, you will want to look out for clauses dealing with future adaptations, marketing strategy, warranty and indemnification. The software house will

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insist on the right to control all aspects of the marketing of the product. It will also need the right to modify the program in case of a name change, a new bug, or whatever. The software house will require that the author state that he or she is the true author of the program, and that the program is original work. Another common clause requires the author to agree to pay for any lawsuit arising from a copyright infringement action brought about the game, usually to the extent of any royalties paid and owing. This protects the software house against attempts by authors to pass off "knock offs," or stolen programs. Finally, the software house will want to be able to require the author to make certain changes if problems, functional or aesthetic, arise with the program.

You, the author, will want to make sure that a clause is included allowing you to terminate the agreement if the program is not marketed within a certain period of time, say six months, or if your royalty payments are over 60 days past due. You might also have other terms which you wish to include, or you might wish to modify clauses of the agreement. Get your negotiating shoes on.

Beyond this, the usual boiler plate clauses relating to assignment (the author can't and the software house can), applicable law, and so on are included. See my previous column for a discussion of these clauses. Of course, the agreement is wide open for modification, so don't feel that the first written proposal is the final word.

Once you are satisfied with the contract, you should sign it. If you make any modifications to the proposed license agreement, you must place your initials next to the modification, even if it is only one character. Then send it in. Remember, if you want something in the agreement, it has to be in the agreement. If you are including part of a letter, or a conversation, those things must be written down and incorporated in the agreement. If not, a standard "merger clause" will limit the agreement to what has been contained in it, and all those phone conversations and letters will be of no effect.

Here I should say a bit about consummating contracts. The party who first signs the contract is the "offeree." Once an offer is made, it can be accepted by the other party by his or her signature and delivery or deposit in the mails. (With option agreements, common in the industry, the acceptance must not only be posted, but it must be *received* by the offeree within the set time period for the contract to be consummated.)

Usually software houses send unsigned forms. This makes you the offeree when you sign and return the forms. They then have the option of accepting the contract. You may withdraw your offer at any time before the other party accepts it, but the other party must *received* your withdrawal notice before he or she accepts. Your withdrawal notice should be in writing; a phone call is hard to prove, and may be legally insufficient.

As you can see, creation and consummation of your license agreement can become quite complicated. As always, I would highly recommend that you take the agreement and any proposed modifications to an attorney. The small sum you pay will both protect your interests and educate you about this intricate legal area.

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Details Of A Magic System (And A Monster Of A Contest)



By Bill Nolan
Rainbow Contributing Editor

As most of you know, we have been working on a new fantasy game for several months. The new game is being designed from the beginning to be computer assisted wherever possible, and as a result we will be able to make the combat system and other facets of the game much more realistic and complete.

Last month we gave you a general overview of the game at its current stage of development, and this month we will be examining the magic system in greater detail. We will also be talking about the details of the monsters and the spells, and if you read a little further you will find a contest relating to these last two items and offering over $400 in prizes!

First, though, let's look at the various colors of magic. You will recall from last month that player characters in the Arcanist, Guardian, and Champion classes must dedicate themselves to one of three colors of magic — white, black, and green.

These three colors represent different faces of the same force, and are *not* to be viewed as hostile to one another. Think of them as different ways to the same truth. For this reason, there is no restriction as to which of these colors can campaign together.

All of these colors of magic are related to nature. The white draws its power from the light and air, from the sun, and from the light and intellect. The black draws its strength from the power of death and darkness, from the moon, and from the spirit of anger. The green finds its source in all life, in growing things, and in love. Each has its particular strengths and weaknesses. For example, green magic will never cause death and only practitioners of the black can create poison.

Non-player characters use other colors of magic, and these other colors — red, orange and brown — are very hostile to the white, black, and green. In addition to this, Dragons use clear magic, about which nothing is known at all. This would be a good area for an aspiring wizard to research.

(Bill Nolan teaches computer science at a local college, moderates a fantasy game once a week, and is a principal in Prickly-Pear Software)

As we mentioned last month, there are three kinds of magic. Trivial spells are little things like push, pull, create fire, and other spells which are of pretty minor use and power.

Battle magic is a group of spells usable by a warrior during a fight. These spells are instant in use and the fighter can still attack that round. An example is "weapon in hand." To see the utility of this, watch Luke Skywalker in Star Wars when he drops his light sabre. He just holds out his hand and the weapon flies into it. That's weapon in hand. Other battle magic spells are disarm, hesitation, jump, mirror image, and trip.

The third type of spells are the regular spells, and these are found in various power levels just like you are used to in other games. These are also found in versions usable by arcanists and guardians, and one class cannot cast spells of the other class. Of course, Champions can cast spells from both classes, but only of the lower power levels.

Arcanists, Guardians, and Champions are assumed to start out knowing the magic language. Other classes must learn it if they want to be able to cast spells. To learn it requires an intelligence score of at least nine. It also requires the locating of a teacher willing to teach it and several months of concentrated study. It will certainly cost a great deal of money!

Keep in mind that once you learn a spell you know it, and do not have to re-memorize it each day. However, the total spells you can cast each day is based upon your force points, and if you try to cast a spell and fail, the force points are still deducted. Also keep in mind that saving throws are based on current force points, not starting force points, so if your force points are depleted you will find it harder to make a saving throw.

Last month I mentioned that if you try to cast a spell and miss by 25 percent or more, you must roll on the dreaded spell misfire table. The percentage you need is given in last month's column, and here is the dreaded table itself. If you fail your percentile roll on casting the spell, roll a 30-sided die and look up the result on the table.

The Dreaded Spell Mis-Fire Table

1) Spell affects caster, or if that was the intent, affects

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DISK DOUBLE ENTRY - If you have spent hours trying to balance your Debits and Credits, this program is for you! Designed for small business, club, and personal use. Enter transactions in a journal type format. Program will maintain current account balances, produce Trial Balance, Income, and Balance Sheet reports and complete Account Ledgers. Will handle up to 300 accounts including report headings and totals. Up to 1400 average transactions on a diskette. Summary reports and four levels of subtotals available. REQUIRES 32K and a user understanding of standard double entry accounting concepts. - $44.95 in BASIC with Machine Language subroutines.

*NEW

STATEMENT WRITER - For use with (and requires) Disk Double Entry. Produces statements suitable for billing from your Receivable accounts. Provides mailing labels to use with your statements and account summaries. Designed and documented to allow you to change formats to accommodate your own special needs. $34.95.

*OCT '82

DISK DATA HANDLER - 64K - Designed to use the full 64K RAM, but may also be configured for 32K. Uses standard ROM's - No special operating system required! Allows you to design disk data files for your specific needs. You define a basic record of up to 14 fields and 246 characters. Provides fast selection and sorting based on any field or combination of fields in this record. Powerful on screen input and update. User defined output of reports to screen, printer, or disk files which may be read by your BASIC programs for any computational or special formatting requirements. Printer reports allow headings, page breaks, and page numbering, and let you pass control codes to drive your printer's special features. Maximum number of records you may work with at one time will depend on RAM configuration and record size - 64K (32K) 1850 (500) - 21 char records, 179 (49) - 246 char records. An optional Extended record linked to the basic record may also be defined. The size of this Extended record is not a factor in determining maximum number of records. Will provide the growth capability needed for your increasingly sophisticated applications. $54.95 in BASIC with Machine Language subroutines.

*JUNE '82

DATE-O-BASE CALENDAR - Puts you in charge of your schedule! Graphically displays any monthly calendar between 1700 and 2099. You put in up to twelve 28 character memos per day - calendar shows where the memos are -call up of day shows details. Use for appointments and a log of past activity. Study the chronology of the American Revolution or note the day your mortgage will be paid off. Search capability allows you to list or print all memos between two specified dates or only ones meeting key word criteria. Date computation shows elapsed time between two dates in days, weeks, months, and years. REQUIRES 32K in BASIC.
TAPE DATE-O-BASE CALENDAR - $16.95 - (max. 400 memos/tape file).
DISK DATE-O-BASE CALENDAR - $19.95 - (over 4,000 memos/disk - max. 300 memos/month).

*RAINBOW REVIEW DATES

*NEW

COMMAND STREAM PROCESSOR - Adds a new dimension to the power of your Color Computer! A program to run your other programs. Will allow you to prepackage a stream of direct system commands as well as INPUT and LINE INPUT to your BASIC program. This results in a totally automated stream of activity. If you understand your computer and the flow of activity required for your total operation, you are ready for the power of Command Stream Programming. In completely relocatable Machine Language - $19.95.

*NEW

That's INTEREST-ing - Time to let your computer do some real computation! This program will help you solve problems dealing with time, money, and INTEREST. Calculates present value, future value, and capital recovery for any combination of payments you specify. Rate of Return computation to predict how hard your money will be working. Special section to compute bond yields (current and to redemption). Amortization schedules about any way you want them - even allows you to change terms in mid schedule! All answers available on screen or printer. $29.95 in BASIC.

*SEP '82

MATH TUTOR - Five programs that go from math fact (+, −, X, /) drill to full addition, subtraction, multiplication, and division at four levels of difficulty. Provides a step by step approach with error correction and rewards for good performance. - $13.95 in BASIC.

*SEP '82

SPELLING TEACHER - Up to 200 of their spelling words stored on tape or disk are presented in four lively study modes including a scrambled word game. - $12.95 in BASIC.

*AUG '82

ALPHA-DRAW - A subroutine designed to let you easily add characters to your graphic displays. You define X and Y coordinates and a string variable of one or more characters and Alpha-Draw will do the rest. Includes all keyboard characters. Comes with instructions for a true line numbered merge of tape files. Works great with the Screen Print program! - $8.95 in BASIC.

*MAY '82

GRAPHIC SCREEN PRINT PROGRAM - Works in ALL PMODES and lets you shift screen image anywhere on the printed page. Relocatable code lets you use all of your 16K or 32K machine. Available for Color Basic 1.0 and 1.1/1.2. Use EXEC 41175 to see which you have and SPECIFY with order. In Machine Language.

SPECIFY PRINTER TYPE

$7.95 - For TRS-80® LP-VII/VIII & DMP 100/200/400.
$9.95 - For Epson GRAFTRAX®, NEC® PC 8023 A-C, IDS-440/445, Paper Tiger® 460/560, Micro Prism® 480, Prism® 80/132 (with dot plotting), TRS-80® DMP-120, TDP-1, Micro Peripherals, Inc. 88G/99G, PROWRITER®, Centronics 739, Mircoline® 82A/83A (with OKIGRAPH I) /84/92/93 and Star Micronics, Inc. GEMINI 10/15.
(Trademarks of Tandy Corp., Epson America, Inc., C-Itoh, NEC America, Okidata Corp., Integral Data Systems, Inc.)

ALL PROGRAMS require Extended Color Basic and are delivered on cassette. All, except Tape Date-O-Base Calendar, are DISK System compatible.

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For VISA and Master Card orders: Include type, account number, expiration date, signature and phone number. Sorry! No COD's.

U.S. and CANADA add $1.00 per order for shipping. Overseas $2.50 per order. All prices in U.S. dollars. Florida residents add 5% sales tax. Return within two weeks if not completely satisfied.

RAINBOW CERTIFICATION SEAL
ALL LISTED PROGRAMS

someone nearby.
2) Spell effects are permanent.
3) Caster loses 2D10 of force points — recover at one per day.
4) Caster loses 1D10 of force points — recover at one per day.
5) Same as 4.
6) Same as 4.
7) No effect.
8) No effect.
9) No effect.
10) No effect.
11) Caster takes 2D10 of damage.
12) Caster takes 1D10 of damage.
13) Same as 12.
14) Same as 12.
15) Same as 12.
16) Spell effects reversed.
17) Spell effects reversed.
18) Area effect spells are triple normal area — roll again for non-area spells.
19) Same as 18, but effect area is doubled.
20) Spell affects wrong area or person — roll to see where or who.
21) Same as 20.
22) Same as 20.
23) No effect.
24) No effect.
25) Spell duration halved if applicable, otherwise roll again.
26) Spell area halved if applicable, otherwise roll again.

LEARNING GAMES
for
CHILDREN (Ages 3-8)

A series of 3 programs on tape

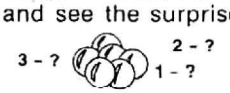
1 - SHAPE TEST - makes recognizing basic shapes fun . . . using voice, color, sound, music and graphics animation.



2 - WORD TEST - match the computer spoken word with the displayed word. A correct response is rewarded with graphics and a song.



3 - COUNT TEST - count the magic beeping marbles and see the surprise at the end.



- 16K ECB and joysticks required
- Order above 3 programs NOW for only $24.95 p.p. Send check or money order

D D SOFTWARE
10 SIMONNE LANE, PEPPERELL, MA. 01463
(617) 433-2372
(Mass. residents include 5% sales tax)

27) Spell drains double force points.
28) Spell drains triple force points.
29) Spell drains one-half normal force points.
30) Spell wiped from memory.

Now, on to the contest. We are in need of original spells and monsters for this game. The specifications of each are given below. If you submit a spell or monster used in the column you will receive a Prickly-Pear Software four-color, screened dragon T-shirt worth $9.95. In addition, the person who submits the entry we judge to be the best in each category—spells and monsters—will receive a gift certificate for $50 from Prickly-Pear Software and a gift certificate for $50 from Sahuaro Software. The second place winner in each category will receive a $50 gift certificate from Prickly-Pear Software. (I was able to arrange these prizes with Prickly-Pear because I know the owner of the company.)

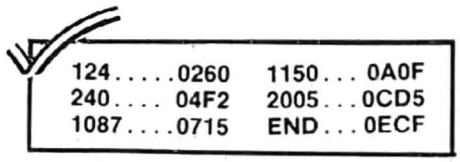
For spells you will need to specify the name of the spell, materials and time needed to cast it, range of the spell, area or number of people affected, the exact effect of the spell, whether or not the victim gets a saving throw, and, if a saving throw is allowed, what will happen if it is successful. The more detail you put in, the better, and the more original the spell is, the more chance you will have to win.

For the monsters we need a very complete physical description with a sketch if possible. We also need to know the usual stats such as speed, size, attack mode, number of attacks, intelligence, special attacks or defenses, and the damage multiplier. If you recall, the damage multiplier is used with our combat system to compute damage.

For reference, a fist is a multiplier of .5 and a long sword is a multiplier of 1. Our monsters are level instead of hit dice or other systems, and you will have to specify a range of hit points. Bear the following in mind: Hit points do not vary a great deal with level in this game. Instead, a character or monster becomes harder to hit at higher levels because of the combat system (which was presented in an earlier issue). The hit point range should be set by the size and toughness of the critter, not the level. As with spells, the more detailed and original your monster, the better your chance to win will be.

This contest will continue through the 20th of January, with the winners being announced in the April issue of *the Rainbow*. (Copy for the April issue is due February 1.) Send your entries to: Contest, Bill Nolan, 9234 E. 30th Street, Tucson, AZ 85710. *Be sure* to mail them so we get them no later than January 20, 1984. All entries become the property of Bill Nolan.

I want to apologize to all of you for accidentally running the same program two months in a row in my column. The fault was mine, not *the Rainbow's*. The program that ran twice was the first stage character generating program, and the one I was supposed to send last month was the new improved character generating program. The correct program is listed below. If you have already typed in the other character generating program, this one is not different, it is only longer. The other program ended when you rolled up your basic characteristics, while this one continues on. If you already have the other one in your computer just go through it and add the necessary lines. Also, check the existing lines, as a few of them have been changed a bit (mostly added on to). If you typed in last month's program you have about half of this one done. This program figures out almost everything you need to create a character for the new game. See you next month, and have a very Happy Holiday.



124.....0260	1150...0A0F
240....04F2	2005...0CD5
1087....0715	END...0ECF

The listing:

```
5 X=RND(-TIMER)
10 DIM C(8),C$(8),CL(10),CL$(10)
20 FOR X=1 TO 8:READ C$(X):NEXT
100 CLS:PRINT" PRESS ANY KEY TO
ROLL":K$=INKEY$:GOSUB 9000:PRINT
" COMPUTING ROLL";:GOSUB 199
110 CLS:FOR X=1 TO 8:PRINTC$(X),
C(X):NEXT X
112 CC=0
115 IF C(1)>9 AND C(2)>9 AND C(4
)>7 AND C(5)>8 AND C(6)>9 AND C(
7)>8 AND C(8)>8 THEN PRINT" ROGU
E",:CC=1:CL(1)=1:CL$(1)="ROGUE"
118 IF C(5)>6 AND C(7)>8 AND C(8
)>8 THEN PRINT" WARRIOR",:CC=1:C
L(2)=1:CL$(2)="WARRIOR"
120 IF C(2)>7 AND C(4)>7 AND C(5
)>8 AND C(6)>9 THEN PRINT" THIEF
",:CC=1:CL(3)=1:CL$(3)="THIEF"
122 IF C(2)>9 AND C(3)>8 AND C(6
)>8 AND C(7)>7 THEN PRINT" ARCAN
IST",:CC=1:CL(4)=1:CL$(4)="ARCAN
IST"
124 IF C(2)>8 AND C(3)>11 THEN P
RINT" GUARDIAN",:CC=1:CL(5)=1:CL
$(5)="GUARDIAN"
126 IF C(2)>9 AND C(3)>10 AND C(
4)>9 AND C(5)>9 AND C(7)>9 AND C
(8)>9 THEN PRINT" CHAMPION",:CC=
1:CL(6)=1:CL$(6)="CHAMPION"
127 IF CC=0 THEN PRINT" COMMONER
",:CL(7)=1:CL$(7)="COMMONER"
128 IF C(1)>10 AND C(2)>9 AND C(
5)>9 AND C(6)>9 THEN PRINT" ELF"
,:CL(8)=1:CL$(8)="ELF"
129 IF C(8)>7 THEN PRINT" DWARF"
,:CL(9)=1:CL$(9)="DWARF"
130 PRINT:PRINT"PRESS 'R' TO RER
OLL OR 'G'":PRINT"TO GO ON.";:K$
=INKEY$
140 K$=INKEY$:IF K$<>"R" AND K$<
>"G" THEN 140 ELSE SOUND 150,1:I
F K$="R" THEN RUN
150 GOTO1000
199 FORC=1TO8:C(C)=0:FORC=1TO8:D
1=RND(4):D2=RND(4):D3=RND(4):D4=
RND(4):D5=RND(4)
200 HH$(1)=STR$(D1):HH$(2)=STR$(
D2):HH$(3)=STR$(D3):HH$(4)=STR$(
D4):HH$(5)=STR$(D5)
210 FOR X=1 TO 4:IF HH$(X)>HH$(X
+1) THEN 250
220 NEXT X
230 C(C)=(VAL(HH$(3))+VAL(HH$(4)
)+VAL(HH$(5)))
240 PRINT".";:NEXT C:RETURN
250 X$=HH$(X):HH$(X)=HH$(X+1):HH
$(X+1)=X$:GOTO210
1000 CLS:PRINT:FOR X=1 TO 7
1010 IF CL(X)>0 THEN PRINTX;".
";CL$(X)
1020 NEXT X:PRINT
1030 PRINT"SELECT CLASS"
1040 K$=INKEY$:K=VAL(K$):IF K<1
OR K>7 OR CL(K)<1 THEN 1040 ELSE
 SOUND 150,1
1050 CLS:PRINT:CL(10)=1:CL$(10)=
"HUMAN":FOR X=8 TO 10
1060 IF CL(X)>0 THEN PRINT X;".
 ";CL$(X)
1070 NEXT X:PRINT
1075 INPUT"SELECT RACE";R
1080 IF R<8 OR R>10 THEN 1075
1081 IF CL(R)<1 THEN 1075 ELSE S
OUND 150,1
1085 PRINT:INPUT"INPUT THE LEVEL
";PL:PRINT:PRINT"WHICH SEX? (M/F
)":K$=INKEY$
1086 K$=INKEY$:IF K$<>"M" AND K$
<>"F" THEN 1086 ELSE SOUND 150,1
:IF K$="M" THEN PS=1 ELSE PS=2
1087 GOSUB 9600:GOSUB 9700:CLS:P
RINT:HP=C(3)+C(7)+C(8)+(PL-1):PR
INT"HIT POINTS =";HP
1088 FP=C(3)+C(2)+C(7)+(PL*3):PC
=(C(5)+C(8)+PL)*3:FD=(C(2)+PL)*2
:FT=(C(2)+C(6)+PL)*2:PRINT:PRINT
"FORCE POINTS =";FP:PRINT:PRINT"
CLIMBING CHANCE =";PC:PRINT:PRIN
T"FIND SECRET DOORS CHANCE =";FD
:PRINT:PRINT"FIND/REMOVE TRAPS C
HANCE =";FT
1089 PRINT:PRINT"PRESS A KEY TO
CONTINUE":K$=INKEY$:GOSUB 9000:S
1=(C(2)*3)+(C(3)*3)+((PL-1)*10):
S2=(C(2)*5)+(C(6)*3)+C(3)+((PL-1
)*10):S3=(C(2)*3)+(C(3)*5)+((PL-
1)*10)
1090 CLS:ON K GOTO 1100,1200,130
0,1400,1500,1600,1700
1100 PRINT:PRINT"COMBAT ADJUSTME
NT = 6":PRINT:PRINT"STARTING SPE
LL CHANCE =";S1:PRINT
1110 LP=30+((PL-1)*5):IF C(6)>10
 THEN LP=LP+5 ELSE IF C(6)>11 TH
EN LP=LP+15
1120 PP=LP
1130 ST=40+((PL-1)*5):IF C(2)=>1
0 THEN ST=ST+5
1135 IF C(5)>10 THEN ST=ST+5 ELS
E IF C(5)>11 THEN ST=ST+10
1140 HI=ST-10
1150 PRINT"LOCK PICKING CHANCE =
";LP:PRINT"POCKET PICKING CHANCE
 =";PP:PRINT"STALKING CHANCE =";
ST:PRINT"HIDING CHANCE =";HI:PRI
```

```
NT:GOTO9500
1200 PRINT:PRINT"COMBAT ADJUSTME
NT = 6":PRINT:PRINT"STARTING SPE
LL CHANCE =";S1:PRINT:GOTO 9500
1300 PRINT:PRINT"COMBAT ADJUSTME
NT = 3":PRINT:PRINT"STARTING SPE
LL CHANCE =";S1:PRINT:GOTO 1110
1400 PRINT:PRINT"COMBAT ADJUSTME
NT = 0":PRINT:PRINT"STARTING SPE
LL CHANCE =";S2:PRINT:GOTO9500
1500 PRINT:PRINT"COMBAT ADJUSTME
NT = 2":PRINT:PRINT"STARTING SPE
LL CHANCE =";S3:PRINT:GOTO 9500
1600 PRINT:PRINT"COMBAT ADJUSTME
NT = 6":PRINT:PRINT"STARTING SPE
LL CHANCES:":PRINT"  TRIVIAL OR
BATTLE MAGIC =";S1:PRINT"  REGUL
AR ARCANIST SPELLS =";S2:PRINT"
 REGULAR GUARDIAN SPELLS =";S3:P
RINT:GOTO 9500
1700 PRINT:PRINT"THIS IS A COMMO
NER":PRINT:PRINT"COMBAT ADJUSTME
NT = 0":PRINT:PRINT"CANNOT RISE
IN LEVEL":PRINT:GOTO9500
2000 CLS:PRINT"ROLLS ADJUSTED FO
R RACE AND SEX":PRINT:FOR X=1 TO
 8:PRINTC$(X),C(X):NEXT X
2005 PRINT:PRINT"CLASS = ";CL$(K
):PRINT"RACE = ";CL$(R):PRINT"LE
VEL =";PL,:IF PS=1 THEN PRINT"MA
LE" ELSE PRINT"FEMALE"
2010 PRINT:PRINT"MORE CHARACTERS
?  (Y/N)";:K$=INKEY$
2020 K$=INKEY$:IF K$<>"Y" AND K$
<>"N" THEN 2020 ELSE SOUND 150,1
:IF K$="Y" THEN RUN ELSE END
9000 IF INKEY$="" THEN X=RND(0):
GOTO 9000:ELSE SOUND 150,1:RETUR
N
9500 PRINT"PRESS A KEY TO CONTIN
UE":K$=INKEY$:GOSUB 9000:GOTO 20
00
9600 IF PS=2 THEN C(8)=C(8)-2:C(
6)=C(6)+2
9610 RETURN
9700 ON R-7 GOTO 9710,9750,9799
9710 C(8)=C(8)-1:C(7)=C(7)-1:IF
C(8)>8 THEN C(8)=8
9720 IF C(7)>8 THEN C(7)=8
9730 RETURN
9750 C(1)=C(1)-1:C(4)=C(4)-1:IF
C(1)>8 THEN C(1)=8
9760 IF C(4)>8 THEN C(4)=8
9799 RETURN
10000 DATA PHYSICAL BEAUTY,INTEL
LIGENCE,FAITH,SPEED,AGILITY,MANI
PULATION,STAMINA,STRENGTH
```


The KEY-264K is here!!

DO YOU HAVE A 32K SYSTEM WITH 64K MEMORY CHIPS ?? ARE YOU STILL BEING TOLD YOU CAN ONLY USE 32K FROM BASIC ??

DON'T BELIEVE IT !! - KEY COLOR SOFTWARE brings you the KEY-264K. An exciting NEW SOFTWARE utility that allows any STANDARD 32K COLOR COMPUTER TO ACCESS 64K RAM FROM BASIC, and with NO HARDWARE MODIFICATIONS REQUIRED!!!

*** Works with CASSETTE based systems! *** *** Works with DISK based systems! ***

The KEY-264K divides the 64K ram memory into two 32K banks or sides, each of which can be utilized independently by the BASIC interpreter, with the ability to switch instantly from one side to the other. IT'S LIKE HAVING TWO COMPUTERS IN ONE!! Have your BASIC program on one side and keep your variables on the other side, or have your main program on one side and your subroutines on the other side, or have your program on one side and use the other side for 4 additional HI-RES pages, or any combination you like. The possibilities are endless because the KEY-264K allows full communication between sides plus the ability to switch back and forth at will, all from within BASIC. You could also have different programs in each side and switch back and forth between them using simple keystrokes, even while the programs are running!! Or run them both at the same time in the FOREGROUND/BACKGROUND MULTI-TASKING mode. Don't buy that printer buffer yet! With the KEY-264K you can be printing in the background side while utilizing your computer normally in the foreground side AT THE SAME TIME!!! Debugging a program? Use either a BASIC command or simple keystrokes to instantly duplicate your program, in it's present status, on the opposite side. Switch to the opposite side later and pick up exactly where you were before!

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The KEY-264K works on 32K systems with "E", "F", or even modified "D" boards and requires EXTENDED or DISK BASIC with GOOD 64K MEMORY CHIPS! Systems with piggy-back 32K or half-good 64K memory chips WILL NOT WORK!!

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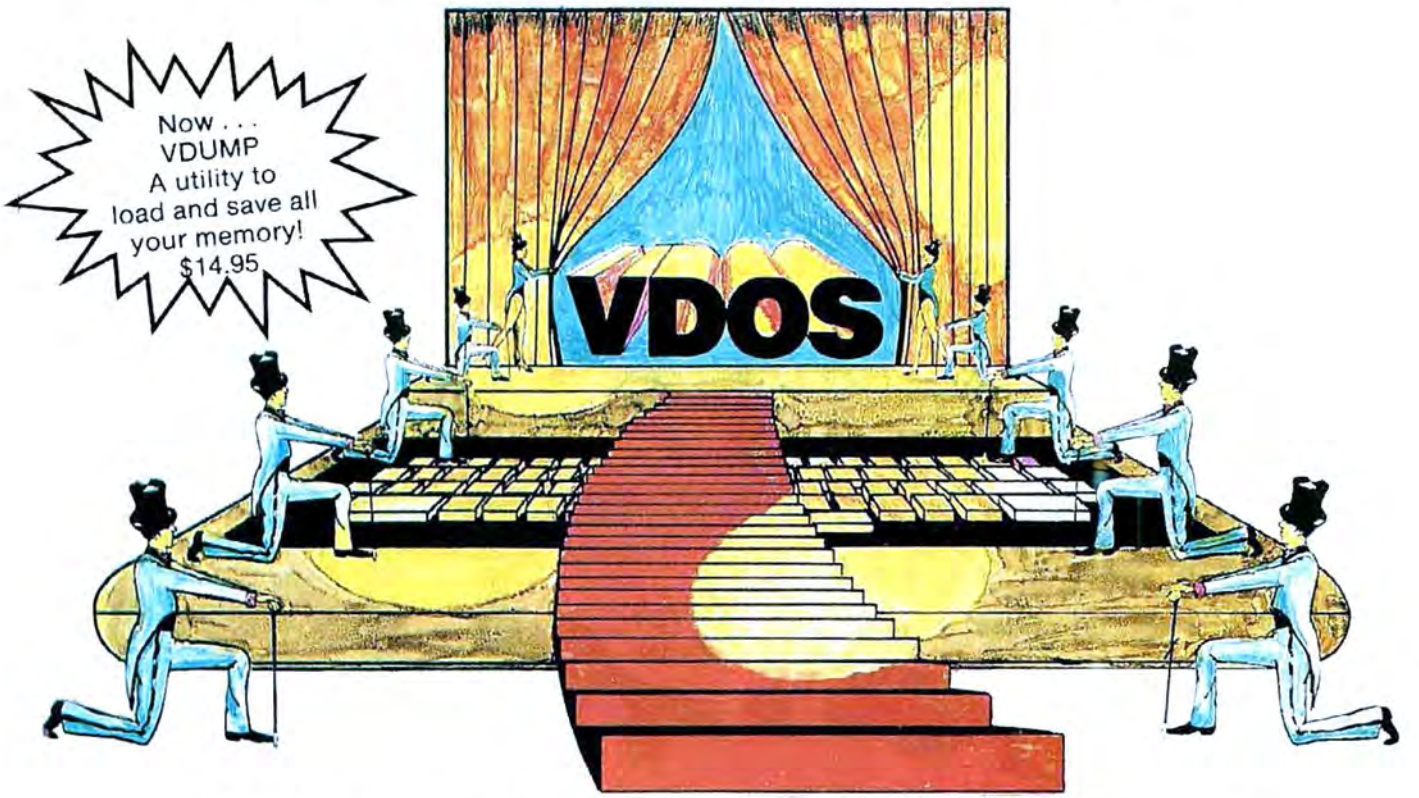
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RAINBOW CERTIFICATION SEAL

WORKS WITH THE NEW 64K COLOR COMPUTER TOO!!

THE UN-DISK



UN-BELIEVABLE

But true! There *is* a disk drive in your Color Computer . . . and it is faster and more efficient than any "hardware" drive you can buy, for any price. This new "disk drive" is called VDOS—for Virtual Disk Operating System—and it will absolutely revolutionize the way you operate your CoCo.

VDOS lets you use the "extra" memory inside your CoCo as a virtual disk, with programs (any programs) stored out of the way. You can "save" and "load" programs from your in-memory disk into working memory, and then run them. When you're done, you can simply access your in-memory disk again . . . and save or load another, and another.

And VDOS is fast. Because you are using memory rather than a mechanical device (like a disk drive or cassette player), programs load instantly. Yes, VDOS is faster than a disk!

VDOS works with all Color Computers—from 16K non-extended to 64K extended. Obviously, the more memory you have, the greater number (and length) of programs you can store. For a 64K system, VDOS also uses the "unused" part of memory, providing up to 50,000 bytes of storage! Now, that's some disk!

We call it VDOS because in the future there will be utilities for your VDOS UNDISK that will give even greater capabilities—such as a full one-pass memory dump to cassette. Other utilities are planned, too.

We believe VDOS is the greatest advancement for CoCo since the introduction of the disk drive itself. And, at less than $100, it is so inexpensive you can't afford to be without it. If you have the "cassette blues," VDOS *is* the answer!

Finally, VDOS is simple to operate. It is entirely self-prompting and comes with a complete manual. But you almost don't even need the instructions—it requires absolutely no technical expertise.

VDOS. The answer to your prayers.

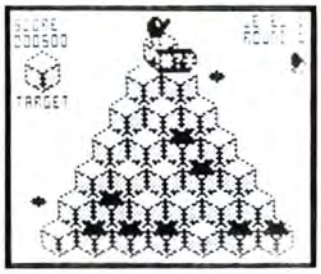
Cassette: $49.95 Add $1.50 shipping and handling; Canadians add $5 for shipping; Foreign points add $9. VISA and Master Card accepted. All Kentucky residents add 5% sales tax. Payments accepted in United States currency only.

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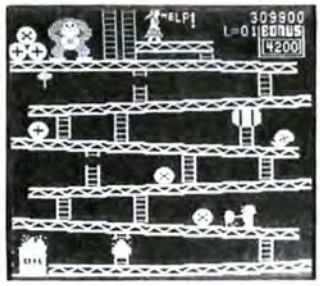
RAINBOW

THE TOP 4 COCO GAMES...



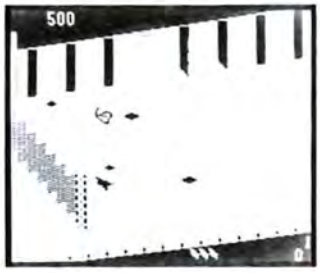
ZAKSUND

From Elite Software comes this fantastic arcade style space action game with 3 different stages of moving 3-D graphics. You've never seen anything like this on your CoCo! Great sound too! 32K Tape: $24.95



GHOST GOBBLER

From Spectral Assoc. This "PAC" theme game has been improved several times. It is definitely the best of its type. Brilliant color, action and sound, just like an arcade. 16K Tape: $24.95



CUBIX

By Spectral Associates. Very much like the arcade smash! Jump little Cubix around the 3D maze trying to change the color of all the squares. With Death Globes, Discs, Snakes, etc. 32K Tape: $24.95

THE KING

Previously called "Donkey King", you simply cannot buy a more impressive game for your CoCo. With 4 different screens and loads of fun! From Tom Mix Software. 32K Tape: $25.95



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TELEWRITER-64

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REVIEWS

KALEIDOPHONE

Editor:

Thanks for reviewing our *Kaleidophone* hardware in your October issue. The instructions *were* a bit confusing, and have since been rewritten.

Unfortunately, the reviewer didn't seem to realize that the software he described was only our (free) KP-83 *demonstration system.*

The very first paragraph of the (now infamous) instructions states that "[KP-83] is mainly intended to demonstrate . . . the hardware" and that it "only scratches the surface of the display possibilities."

The next paragraph explains how to obtain our "user" system, *Kaleidophonics 1984* ($15). It includes five separate menus with 26 items each. Any of these displays can be chosen "on the fly" with a single keystroke. BASIC, Extended BASIC, and all the unimplemented graphics modes can be used, including several 9-K modes unavailable anywhere else.

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Fred K. Lenherr
New Salem Research

FURY

Editor:

We at Computer Shack had reached the same conclusions as your reviewer did (October 1983, Page 256) and we have changed *Fury* so that now in the 32K version you can toggle both the voice and the heat seeking mines on and off.

Any previous purchasers of the game can get the newer version by returning the old game and $5 for the update and $3 for shipping and handling.

Gordon Monnier
Computer Shack

ROBOTTACK

Editor:

The reviewer who did the review of *Robottack* (Bob Safir, July 1983, Page 233) seemed to misunderstand some things about the game. First of all, *Robottack* is not a clone of *Berserk*, but an excellent clone of the arcade game *Robottron.* Second, it is necessary to clear the screen of guardian robots to end the frame. This is not determined by point levels, as Bob says.

I think we shouldn't blame Bob for these mistakes because he is an adult and kids generally understand these things better than adults.

Daniel Fass (age 13)
Marlboro, NJ

MATH ADVENTURE

Editor:

I would like to thank you for publishing the review on *Math Adventure* (October issue). I would like you and your readers to know that the changes specified plus some others have been made.

Thanks for a great magazine.

Dan Tappe
The Software Factory

COCO MAIL

Editor:

While we realize that all software presented for review may receive a poor or bad review we would like to comment on Mr. Esser's review of our *CoCo Mail* program. (October 1983, Page 267).

Mr. Esser pointed out several things about the program that I will try to explain in some sort of order.

He referred to the incorrect use of the terms "file" and "record" in the manual. This was intentionally done in an effort to make the manual as easy as possible to understand by a person that has no experience in the operation of a computer. It was tested on a number of people before being finalized and seemed to be generally well liked. These same people with a little general instruction in how to turn on the computer were able to run the program with little problem. Perhaps we attempted to make the manual "too" simple.

Mr. Esser's next negative remark was about the update file menu. The original version 1.0 that was reviewed accessed the disk quite often. All registered users of the program and *all* retailers have version 1.1 that corrected the update section mentioned by Mr. Esser. This upgrade and all other version enhancements of *CoCo Mail* are supplied to users at no cost.

Mr. Esser leads the reader to believe that 15/16 x 3 inch labels are the only labels this program will print. The program as written will print any standard size single carriage 15/16 inch label up to 3 inch in length. It handles only 3 inch wide labels in the double wide mode. This was done for one reason. *CoCo Mail* was developed with a specific purpose in mind. It was designed for an intermediate or novice user with one disk and a 16K memory. It was also designed to maintain a small mail list where some data entry about each name may be used. In our experience most companies sell double wide labels in minimum quantities of 10,000 while single carriage sizes are available in as few as 1,000. Many actual users of the program are using the single carriage label for just that reason.

Mr. Esser did point out that the create transfer file offers no option. We did not print it in the manual (an oversight) but the user can retain the original "master" disk by running the process file option on the disk after moving the desired files. Options will be added on version 1.2 out in the first half of October.

Mr. Esser complains that there is no option for using more than single drive systems. After all this is a one disk mail list system. He then complains that the disk allocation would allow for a whole seven more records! We like even numbers.

He then made the comment that the screen handling was very "elementary." This is very true, however, to scroll a menu off screen does require the user to repeatedly input alpha characters at the menu prompts rather than numbers. Version 1.2 will use string input but we feel that a person of well below average intelligence is capable of distinguishing between a number and a letter.

The next complaint again details the failure of the update section returning to the main menu. This is no longer in the program and our version 1.2 will also add the scroll feature.

Feedback from our users suggests to us that many of Mr. Esser's impressions about our manual and the usefulness of the program are just plain incorrect. Mr. Esser concluded that the program "certainly will not meet the needs of a business which has more than 200 customers without a lot of effort on the part of the user." We again will point out that *CoCo Mail* was not designed to handle a large general mail list but rather to track a specific number of clients in a very specific way and be able to create secondary files based upon that data file. We also have users that are maintaining files over 1,000 names that are very pleased with the programs performance.

He continues his complaints by claiming that up to 30 grans of the disk are not used. The truth is that during a worst case file transfer the disk is nearly completely filled. In this instance part of the disk is still unused, but what about a damaged or used disk? I'd rather make the program reliable.

Our last objection comes to his reference of program price. Being a CoCo user I must admit that $59.95 is a lot for a mail list program, but I have spend much more for programs that have laid on the shelf unused after a few attempts. The point is that however flawed it may be, *CoCo Mail* works and works quite well. It performs a mail list task of which we have not seen other programs able to do that are comparably priced.

Thank you.

Robert W. Butler
Reitz Electronics, Inc.

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DRAW-IT Doesn't Quite 'Make It'

One of my favorite applications for my CoCo is "computer art," that's part of the reason I bought it two years ago rather than anything else available at the time. I have always been interested in art and am a chronic "doodler." So, as you might guess, when *the Rainbow* sent me a "drawing" program to review, I was more than a little interested.

DRAW-IT, unfortunately, just is not quite up to snuff. It isn't totally without possibilities, however, so I'll give a quick run-down of what the program does and then point out what I think could be done to improve it.

The purpose of *DRAW-IT* is, of course, to draw pictures on the TV screen. In this case, only in *PMODE4* Pages 1 -- 4. This is done by drawing and erasing lines, circles and boxes. There is also one handy command that I found useful, which my "other" draw program doesn't have, and that is VECTOR. This allows you to draw *from* a given point in any direction definable in even degrees 0—360 *for* a specified length. You may then paint any enclosed area you want. When your picture is finished you may save it to tape.

Now for the bad news. Starting from the top, the documentation is just barely adequate, consisting of one side of 8 x 11 paper listing the function definitions and a *brief* outline of the procedures to be used. A word to any users . . . *follow these procedures!* As for the program itself, since it is in BASIC almost all of the "deficiencies" (my opinion) could be easily corrected by an intermediate level programmer. The first complaint I have is relatively minor: there is no way, in the program, to bypass the explanation pages and go straight to the graphics once you are familiar with the commands. There is a note in the "documentation" that you can type *GOTO 100* rather than *RUN*, but one or two more program lines could have done this with an *INKEY$*. I got used to the way you have to set a start and end point for most functions. And I liked the option of changing the jump values for the arrow keys (1, 5, 10 or 20 pixels per key-press). There were, however, two commands which didn't work exactly right: BOX and VECTOR. For some reason there is a line in the BOX subroutine that *erases* a diagonal line when you *DRAW* a box. This is easily deleted. The formulas used by the VECTOR command are just a little off. I'm not sure if it's computer rounding errors or if the formula needs to be refined, but to get straight lines at the eight compass points for instance, four of them have to be adjusted from their true values (45=44, 180=181, 225=226 and 270=271). The other easily changed function is the tape save. As written, the program will operate with the disk controller plugged in, but will not *CSAVE* properly. A method for doing the type of graphic dump used by the author, with the disk plugged in, was published over a year and a half ago by *Chromasette* (CSAVE "filename," PEEK(188)*256, PEEK(188)*256+6143 ,380). And with the addition of an *IF/THEN/ ELSE* the program could have the option to *CSAVE* to tape or *SAVE* to disk. This is especially nice with a "screen print" program, have everything on one disk and print out anything you have *SAVED*.

The program has a decidedly incomplete and rushed look and I cannot really recommend it at this time. But, if JPS were to improve the documentation a little and make a few adjustments (and maybe even a couple of enhancements) to the program then it would be a nice little utility.

(JPS, 11462 Columbus Ave., Fostonia, OH 44830, $15.95 tape)

—Bruce E. Sterling

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Gomoku/Renju A Pair Of Oriental 'Brain' Games

Gomoku and *Renju* are two closely related games which are contained in a ROM Pak from Radio Shack. Because of the oriental name for the game, I was surprised to find that I had played *Gomoku* as a child. You probably have also. I also found out that I had played *at* the game rather than played the game. The characteristic of oriental culture which we Americans have trouble understanding is its seemingly contradictory nature. Simplicity often may hide complexity.

The object of *Gomoku* is to be the first player to place five counters in a row, either horizontally, vertically or diagonally. You and the computer alternate turns in placement. The computer shows this game as blue and yellow pieces on a green and red grid. Blue moves first and the game starts with you as the first (blue) player. You may change this to allow the computer to move first. Moves may be made by either the arrow keys or the joystick. Using the joystick takes a while to get used to but does work. The keyboard is better.

Options which are available in this game include eight levels of play and change of board size to sizes from 9x9 to 15x15. Also the computer can play by itself, and may display the moves it is thinking about. It can give a hint, select book openings, take back moves, and step through the past game. It also is possible to have human players play both sides with the computer used only as judge and playing board.

When I was a kid playing this game, the other kids and the adults who played it with me assumed this game was simple because it looked simple. I never lost a series of games as a child because I knew a few tricks in the "simple" game. At the highest levels, however, the computer is slow but almost unbeatable. After the large number of flashing arcade games which are tests of reflexes, this game is interesting as a test of brain power. In a way it hurts much more being beaten by the computer when you have all the time needed to find the best moves. The rule book tells me that *Gomoku* is a forced win for the first player. By that it means that if a perfect series of correct moves are made by the starting player, he will win. Above level five I cannot win. At the lowest level I won about 80 percent of the time, and at level 3 (the start up default level), I won about 50 percent of the time. I played mostly at levels one, three, and six. The other levels appear to be in about the expected ratio. My wife wins almost the same number of times as I do, and my nine-year-old beats the computer at level one about 40 percent of the time and at level three about 10 percent of the time.

The other game in the pack is called *Renju*. This game is really the same game as *Gomoku* but it is intended to give the first player a handicap. The first player is given major restrictions on the types of moves which can be made and on the openings which may be used. No such restrictions are given to the second player (yellow). In light of the large number of options which are available in *Gomoku*, there does not seem to be a need for this variation.

There are several things I noticed while playing the game which cannot really be considered as bugs. At the lowest levels the computer plays irrationally. It will make several very good moves and then miss something very obvious. While using the display mode to have the computer show what it is thinking, the moves are made so rapidly, especially at the highest levels, that they cannot be seen. The manual to this game is mostly well written, but the description of *Renju* rules is rather unclear. I am not sure that I understand all of the rules of this variation.

The hints given in the hint mode are rather strange. It appears that the hints are given at several levels lower than the computer is thinking about for its own moves. If you follow the computer's advice, you will almost have to lose. One example of this might be given (one which also, in a small way, illustrates tactics). If one player has three markers in a row with no opposite colored marker at either end, the other player is forced to make a move at one end to avoid losing. (If you have four in a row unopposed, you have a forced win by placing a counter on either end). When the computer has three in a row, it will not often give the hint to cover one of the ends to prevent a computer win. Does the CoCo want to win?

The only other pure thought game that I have played against the computer is the Radio Shack Chess ROM Pak. That game is easily beaten: *Gomoku* is not. I don't believe that the computer can be beaten at the higher levels of *Gomoku* without a great deal of study. If you are interested in having your *brain* beaten by the CoCo instead of your *trigger finger*, try *Gomoku/Renju* for a real challenge.

(Radio Shack, Catalog #26-3069, $19.95, ROM PAK)

—Tom Roginski, Ph.D.

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Transtar-315 Color Printer: Richness Of Color And Quality

By Paul S. Hoffman

What has always pleased me the most about the Color Computer is the color graphics. What's always frustrated me the most is the lack of a reasonably priced full-color printer to use for screen dumps. Now there are actually a couple of choices — nothing as cheap as the Gemini or the DMP-100, but what do you expect for full-color?

Radio Shack now has available an ink-jet color graphics printer, the CGP-220, for $699. I haven't had much of a chance to play with it, so this isn't really a review of the Radio Shack product. I did, however, check the manual thoroughly, and although a screen dump program is mentioned, it is not supplied with the machine, and no one seems to know when it will be available.

The other offering in the reasonably-priced color printer sweepstakes is the Transtar-315 Color Printer for $599. It is a dot-matrix printer manufactured by Seikosha, using technology quite similar to that in the Radio Shack DMP-100 (I have a Line Printer VII, the older brother of the DMP-100, and I know for a fact that it's a Seiko, too). Instead of one hammer, however, there are four hammers, one for each color. The four-color ribbon (yellow, magenta, cyan and black) passes the hammers at an angle, so that each hammer can access a separate color without the ribbon being shifted up or down. The ribbon is in a replaceable cartridge ($14.95), but Transtar also sells ink cartridges (the ribbon re-inks itself as it moves — four ink cartridges, one for each color, do the job). So, if you want to renew the ink supply before the ribbon itself wears out, it will only cost you $7.95 for a set of ink cartridges. I do think it would be nice of them to provide black ink cartridges separately, since the black is likely to go first — but at this time, they only offer all four colors in one package. To date, I've done around 100 pages of text (black), about 65 full-color screen dumps of various sorts, and around 15 double-size screen dumps, and the cartridge is having a hard time re-inking the ribbon. I've found that doing a color dump that doesn't use black helps to temporarily improve the inking of the black ribbon, but otherwise, a long document gets very gray toward the end. And by now, a screen dump with black as a major color is definitely out!



Now, what can you do with this full-color printer? Well, it will print in typical 80-column format or an extended double-width type; but it will also do compressed type (106 characters per line) and do that typeface in double width, too. Of course, it has dot-addressable graphics capability, even to the extent of specifying the color of each individual dot! One mode available is the "color-scan" mode, in which the user program passes to the printer a separate code for each pixel on the screen, letting the printer organize the information into *single-pass* multiple-hammer runs. In fact, if the user program sends the printer *all* the yellow data for a row, then all the magenta data, all the cyan data, followed at last by all the black data, the printer will wait until every byte has been sent (in a double-width printout of a 256-pixel wide picture, that's 2K bytes of information!) and then assemble that data into a single pass, each hammer striking when needed.

It is possible to send the information for a screen dump to the printer using a simple BASIC program, but the printing takes over half an hour! Most of this is due to the slowness of working through the BASIC interpreter to determine the correct values to send, and then sending them one at a time.



The machine language dump available from Transtar (if you let them know you have a CoCo or TDP-100) will dump pictures in five different modes: *PMODE1*, *PMODE3*, *PMODE4*, Alpha-semigraphics 12 or Alpha-semigraphics 24. In *PMODE4*, it even imitates the artifacted blue and red colors. Red and blue can be switched if they come out contrary to your expectations. It is also possible to dump a *PMODE4* screen just in black and white, and make lines come out either black on white or white on black. A regular size dump (2⅜" by 3⅛" takes 3½ minutes while a double-size dump (4⅞" by 6⅜") takes 8¾ minutes.

The standard configuration of the Transtar-315 is with only a parallel interface. To run it with a Color Computer, you will need a serial-to-parallel converter or purchase from Transtar an optional serial port for $119.95. Quite frankly, I find my Botek interface quite adequate at a substantially lower price.

A frustrating side note: I bought my serial-to-parallel interface for use with the LP-VII, and adapted it to draw power from the printer. Now I was confronted with a printer that did not supply the +5 volts needed for the interface! Adapting time again!

Others who have dealt with trying to operate non-Radio Shack printers with the CoCo have discovered the problems created by CoCo expecting a printer to do its own line feed after a carriage return code. The Transtar-315 usually expects a distinct code for a combined linefeed/carriage return ($0A), while the computer's standard "end of line" character is $0D. The T-315 just returns the carriage to the beginning of the line when it encounters $0D. Fortunately, there is a DIP-switch setting which corrects this problem so that the printer *will* advance a line with the $0D carriage-return code.

Some good points: I'm amazed at how *quiet* this printer is! The noise-suppression capability of the cover is phenomenal, considering how noisy its cousin, the LP-VII is. The paper-feeding mechanism is a combination of tractor and pin-feed, so you can use standard fan-fold paper but also feed single sheets. Although printing is not bi-directional and reverse movement (backing up a line) is also not an option, at least you can turn the carriage backwards to move higher on the page. My letterhead involves overlaying two separate screen dumps, and this is very easy by backing the paper up. Controls on the top of the printer include "STOP," "LINE FEED," and "FORM FEED." There is a power-on light and a paper-empty light (also a "copy" light which functions only with special Apple-oriented screen-dump hardware).

Some annoyances: The manual gives no guidance in reference to lining up the paper in the machine. Looking at a four-hammer head with a diagonal ribbon gives you little clue as to exactly *where* the printer will start printing. The ribbon cartridge takes up three whole inches on the left side of the carriage, so 9½" fan-fold paper is definitely *not* centered in the machine. You have to get things lined up by trial and error. On my unit, the tractors seem to slip ever-so-slightly, so that after a number of pages the pin holes on the paper start tearing. One multi-page printout of an assembly listing got hung up in the machine; it sent an error code which *EDTASM+* didn't recognize, and I lost a good segment of the assembly into the tether. The printed labels for the lights and switches, as well as the printed nameplate, are either of too thin a plastic or have too weak an adhesive — at any rate, they're blistering. It's rather sloppy looking.

In summary, I think it's an okay machine for the price. I'm *very* pleased with the richness of the colors and the density of the dot-pattern in both graphics and alphanumerics. I hope I will be able to keep obtaining re-inking sets and/or ribbons. At this point I have no idea what problems I'll run into if it needs servicing. You might have difficulty finding a dealer who handles the T-315. A quick note or call to Transtar will give you at least who the closest wholesale distributor is, and you can have your local computer dealer special-order for you.

(Transtar, Box C-96975, Bellevue, WA 98009, (206) 454-9250, $599)

SAV-A-BYTE
A CoCo Life-Support System

I was sitting at the desk, tapping away at my CoCo keyboard. Another article for *Rainbow* was due. Ah, the wonders of modern word processing: Move a paragraph here, delete a typo there and now for the automatic spelling correction . . . Crackle, zap! Blam! Oh no! That little rain shower outside has just escalated into a thunder bumper. Quick! Save everything to the backup disk! Zap! Flicker . . . Nuts, too late.

Summer thunderstorms are fairly common in northern Kentucky. I suspect that your part of the country gets its fair share, too. I remember one week this summer when the lights went out at least seven times. My CoCo was getting amnesia faster than kinfolk who owe money.

Ed Bordeaux of South Carolina gets his fair share of power outages, too. Most folks just talk about the weather. Mr. Bordeaux is one of the few to actually *do something* about the weather. He invented the "SAV-A-BYTE" battery back-up system for the TRS-80 Color Computer. Thanks Ed.

SAV-A-BYTE looks kind of like a game cartridge with a chunky little battery hanging off it about the size of a couple of paperback books stacked together. The gadget doesn't really use up your expansion slot -an extension plug for your disk drives or game cartridges is provided.

SAV-A-BYTE is easy to use. Your kids shouldn't have to explain it to you more than once. Just remember to plug it in like a game cartridge, turn the computer on and turn the SAV-A-BYTE on. (It's got a little rocker switch on the side.) A little red light shows that the gadget is working and that the battery is charging.

Bordeaux recommends that you leave the CoCo and the SAV-A-BYTE turned on all the time. He says that "constant ON will not harm your CoCo . . ."

When the battery is fully charged, it is supposed to keep a CoCo alive for three hours. The screen display will not work but CoCo has no amnesia! If you expect a prolonged power outage, you can even save memory to cassette tape—provided that your tape recorder has batteries that work.

By the way, if you do decide to turn off your CoCo, remember to turn off the SAV-A-BYTE too. Otherwise, the gadget will valiantly try to keep your CoCo awake even though you meant it to sleep! I loaded in *Zaxxon* one evening, played for a while and then turned off the computer. I came back a few minutes later to work on something else. When I turned on CoCo, there was my spaceship, diligently zapping the enemy in demonstration mode!

I write articles and I write programs. I enjoy these creative activities immensely; but an artist *hates* to have his or her paintings dragged through the mud. I hate to have two hours of work *erased* by a fluke of nature. Thanks again, Ed.

(SAV-A-BYTE, 2857 Emanuel Church Road W., Columbia, SC 29169, $99)

—Dr. Laurence D. Preble

Scott Adams' *Adventures* Finally Come To CoCo

It was a million years ago; it was just yesterday . . .

It seems like it was an eon in the past that I bought my first computer magazine, a 400-page book called *Byte*. I was attracted by a burning interest in computers in general and the cover artwork — a pirate crawling through the window, the Starship Enterprise hovering in the sky, a snake under the bed . . .

And one little word in the middle of the page near the bottom. That word was "Adventure!"

Perhaps this recollection into the past will give you some idea why *the Rainbow* seems to have a soft spot in its heart for Adventure games. We have our Adventure Contest, our special Adventure issue. Maybe, just maybe, that all is because our first close encounter with a computer-kind was through the ages of an Adventure game.

I remember spending days and days devouring *Byte* and, at the same time, discovering a real-to-life Adventure game hidden in the bowels of a local DEC PDP-10 mainframe. It was the famous "Adventure" Adventure in the well-known (and much-explored) Colossal Cave. I spent hours trying to get past the blasted snake.

The date on the cover of that issue of *Byte* was December, 1980.

It contained several well-done articles on Adventure games. One by my friend Bob Liddil, a listing for an Adventure game program by a fellow named Scott Adams and, probably most significant of all, an advertisement on Page 121 for something called a TRS-80 Color Computer.

(Are you all following this?)

Well, Scott Adams' article contained this phrase, which the editors of *Byte* seemed to think was important enough to highlight, that seemed to sum things up for me. Adams wrote about the original Adventure, saying "It seemed unfair that such a fascinating game was restricted to such an expensive machine," meaning, of course, DEC's PDP-10.

In the vernacular of 1980, I said to myself: "Right On." And *then* I noticed the listing for an Adventure Adams had written for the Radio Shack Model I called *Pirate's Adventure*.

What did I know? I went out and bought a TRS-80 Color Computer and sat down to type in *Pirate's Adventure*. When I ran out of my 4K memory, I called Adams' company, Adventure International, to tell them that there must be some problem with the listing in *Byte*. While on the line, I wondered to them when Adams' games would be available for the Color Computer.

Not for some time, if ever, was the reply.

I want you to know that I sat down this week and, for the first time, played *Pirate's Adventure*. Three years later, the dream came true — and in spades. All the Scott Adams Adventures, save the first, *Adventureland*, have just been released for CoCo.

I do not want it to appear that this is the greatest thing to happen since someone found out how to slice bread. After all, we've been fortunate enough to have some really excellent Adventure games available for CoCo. Those from Mark Data Products, Spectral Associates and, recently, Radio Shack itself, come immediately to mind. But the entry into the CoCo field of the Scott Adams Adventure series is a significant event nevertheless.

For the record, the Scott Adams Adventures are called *Pirate's Adventure, Mission Impossible, Strange Odyssey, The Count, Voodoo Castle, Pyramid of Doom, Mystery Fun House, Golden Voyage, Ghost Town and Savage Island I* and *II*.

And this is a review on all of them. Or none of them. It kind of depends on how you look at it.

These Adventures are all text Adventures — what the Adams people call "Compu-Novels." For the most part they are complicated to play, provide some real head-scratching and are laced with some Adams-produced humor to lighten the task of looking for treasure (or escaping the Count) in the dark of night.

Roger Schrag, who has contributed a number of fine utilities to *the Rainbow*, is the author who converted all the Adams programs for CoCo. All are in machine language, and, as such, are fast and very enjoyable to play.

The text screen is divided in half, with the upper part designated to show your location and whatever it is you see. The bottom of the screen is yours — and also gives you the responses CoCo provides to help you through your Adventure. The action is smooth, easy and, well, to use an overworked word, *friendly*. Yes, the Scott Adams Adventures are *enjoyable*.

In the time they have been with us, I have not had an opportunity to delve into all of them. And I have not, honestly, had the time to work even one of them all the way through. But I have had a goodly number of hours in front of the keyboard with them, and I can hardily and easily recommend them to you as a good buy and a fun time.

You may well ask: Is this just an example of someone trying to cash in on the CoCo market with some old Model I games? The answer is a resounding no! These Adventures are among the top in my hit parade, based on sheer playability and uniqueness. Indeed, they are classics in the true sense of the word and as anyone who has read or been captivated by the classics of literature, poetry or art knows, such works belong in a special category of their own.

The Scott Adams Adventures are the Mona Lisa of the computer art form. You will think, ponder, chuckle and have a dandy time with them. I commend them to you.

(Adventure International, P.O. Box 3435, Longwood, FL 32750, tape $24.95)

—Lawrence C. Falk

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Business people use spread-sheets to organize columns and rows of figures. DYNACALC simulates the operation of a spread-sheet without the mess of paper and pencil. Of course, corrections and changes are a snap. Changing any entered value causes the whole spread-sheet to be re-calculated based on the new constants. This means that you can play, 'what if?' to your heart's content.

But DYNACALC isn't just for accountants. DYNACALC can be used for just about any type of job. Not only numbers, but alphanumeric messages can be handled. Engineers and other technical users will love DYNACALC's sixteen-digit math and built-in scientific functions. There's even a built-in sort command, so you can use DYNACALC to manage small data bases - up to 256 records.

DYNACALC will let your computer do just about anything you can imagine. Ask your friends who have VisiCalc, or a similar program, just how useful an electronic spread-sheet program can be for all types of household, business, engineering, and scientific applications.

DYNACALC is designed to be used by non-programmers, but even a Ph.D. in Computer Science can understand it. Built-in HELP messages are provided for quick reference to operating instructions.

DYNACALC has a beautifully simple method of reading and writing FLEX data files, so you can communicate both ways with other programs on your system, such as the Text Editor, Text Processor, Sort/Merge, RMS data base system, or other programs written in BASIC, C, PASCAL, FORTRAN, and so on.

Except for a few seldom-used commands, DYNACALC is memory-resident, so there is little disk I/O to slow things down. The whole data array (worksheet) is in memory, so access to any point is instantaneous. DYNACALC is 100% 6809 machine code for blistering speed.

Color Computer DYNACALC works with the FLEX operating system from Frank Hogg Laboratory (64k required). If you aren't already using this powerful operating system, we have a special deal for you: order DYNACALC (regularly $200) and FHL Color FLEX (regularly $99) together for only $250.

To order, see your local DYNACALC dealer, or order directly from CSC at the address below. We accept telephone orders from 10 am to 6 pm, Monday through Friday. Call us at 314-576-5020. Your VISA or MasterCard is welcome. Be sure to specify that you want the Color Computer version.

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DSKLDR - Moves Addresses To Load From Disk

A number of machine language programs, both games and utilities, were written either before the disk interface appeared on the scene or on systems without the disk interface installed. Such a system might be a 16K CoCo. In order to provide enough memory in which to load the program, it had to be loaded starting in the area of memory reserved for the disk interface to store information and thus the problem. These programs had to be loaded and run with the disk interface out or they would not run properly. *DSKLDR* is a program written to read these programs and write them to disk in such a way that they can be loaded from the disk in the usual manner and executed.

The *DSKLDR* is supplied on tape and comes with two pages of documentation. The program itself is relatively simple to operate and does not require a great deal of documentation. It is actually self-explanatory. The prompts are supplied in sufficient detail so that the user knows exactly what is being asked for. The program is written in BASIC and can be loaded from tape and saved to disk in the normal manner. Thus there are no backup problems.

Running the program brings up the main menu, which asks if you would like instructions. Actually they are not entirely running instructions. Included is a brief description of how the program operates and what it is looking for. Thus, if for some reason you forget how to answer the prompts, all you need do is run the program and ask for the instructions. After the instructions section, the user is presented with the second menu. This menu will ask for the name of the tape file to load. Once the name is supplied, the user is instructed to load the tape and press [ENTER]. The screen is cleared and the message "LOADING TAPE" is centered on the screen. Once the program has been loaded, the screen clears and the following menu takes its place.

```
FILE NAME :
NORMAL LOAD ADDRESS
START              END
EXEC
RESTORE INTERRUPTS (Y/N) ?
NEW DISK FILE NAME :
```

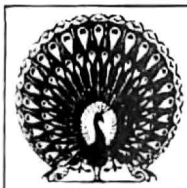
Once these prompts have been answered, the screen again clears and the centered message "SAVING TO DISK" appears. When the save is complete, *DSKLDR* asks if you would like to save the program again. If the response is yes, you are requested for the new disk file name. If the response is no, then you are asked if you have another program to save. If the response here is yes, you are returned to the beginning of the program immediately after the instruction section. If the response is no, then the program is exited and you are returned to BASIC Interpreter.

The *DSKLDR* program reads the program to be fixed from tape into a block of memory reserved above itself. Once the program has been read in, a module is attached to the back of it and the execute address changed to the entry point of the added module. That entire block of memory is then saved to disk. When the program is loaded from disk, the attached module is also loaded and executed. The program is then copied from its high memory location to its original memory location. It will now run as if the disk interface were not attached. The disk structures are destroyed, but in the case of most games and machine language programs, a cold start is required and the structure will be restored. Thus no real damage will be done. *DSKLDR* will only run on 32K machines and will only handle programs with lengths of 16K or less. Thus there will be some programs that it will not be able to move from tape to disk.

DSKLDR is a BASIC program that runs as advertised. It will load most 16K machine language programs from tape to disk. *DSKLDR* is designed to move those programs which interfere with the disk interface to disk in such a manner that they can be loaded from disk and run with the disk interface installed. I used *DSKLDR* to move two of the programs which I have on tape and which will not load from tape and execute properly with the disk interface installed. In both cases, the disk version created by *DSKLDR* ran perfectly. Although *DSKLDR* does not require the user to know the load, end and execute address, it does have the limitation of handling only 16K programs and requires a 32K computer. The program is well written, and walks the user through the necessary steps. It has an instructional section built-in, thus eliminating the need to find the instruction if one does not remember exactly how to run the program. The price is such that I would think it should be in the library of every serious games player who owns a disk drive.

(Stuart Hawkinson, 6695 S.W. 203rd Court, Aloha, OR 97007, $13.95 postage paid)

—Frank J. Esser



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BEWARE of products that do not work in all versions of the CoCo. We guarantee ours will.

BEWARE of products that do not work with all expansion units. We guarantee ours will.

BEWARE of products that do not work with disk systems. Many won't, but ours will because they are fully decoded. Remember, even if you don't own a disk now, you will someday and you don't want to be stuck.

BEWARE

BEWARE of products that are housed in cheap plastic. Ours are encased in a sturdy metal case to eliminate TV interference.

BEWARE of manufacturers that do not offer software support. The library of music and speech synthesis programs shown below is only the beginning of our support.

BEWARE of manufacturers that try to cut corners. Our boards have gold plated fingers and important IC's are socketed.

MUSICA

Speech Systems was the first to offer the CoCo community 4 voice music with the **COMPOSER**. We now offer you an incredible 4 voice music program that contains features typically only available on hardware music synthesizers costing 10 times the price.

- The notes are displayed on the screen in high resolution graphics.
- Treble and bass staffs are shown individually.
- Notes are input using keyboard arrow keys or joysticks.
- You probably don't believe that. It's true, you can input notes using a joystick. Up or down movement positions the note on a staff, right or left motion makes it a flat or a sharp.
- You can insert a few notes and listen to it immediately.
- You can stop and start the music at any point for editing or crucial analysis.
- You can develop an unlimited number of timbre definitions using a super-fast waveform synthesis option.
- You probably don't believe that one either. But it's true.
- The tempo can be varied during compositions.
- Music may be saved and loaded and may even be called from your own BASIC program.
- The music may be directed to the TV speaker or the **STEREO COMPOSER** (see below).
- Special effects include chorus and 3-position stereo with three voices, and exchanging stereo channels during execution (see STEREO COMPOSER).
- **MUSICA** automatically adjusts to 16K and 32K machines.
- **MUSICA** is a machine language program that performs all functions super fast.
- **MUSICA** is completely software, no need for additional hardware.
- We guarantee **MUSICA** is the best music program you can buy for the Color Computer.

MUSICA (Cassette) $34.95
MUSICA (Disk) $39.95

THE COMPOSER

The **COMPOSER** is a 4 voice music compiler with a 7 octave range. A unique waveshape is provided for each voice. Dotted and double dotted notes are supported, as well as sixteenth and thirty-second notes.

The **COMPOSER** allows music to be played at any tempo in any key. While the music plays, a changing random kaleidoscope pattern is displayed. This may be disabled to allow the user to display anything including the words to a song.

Music compiled using the **COMPOSER** may be played independent of all other software. The **COMPOSER** is menu driven making it extremely easy to use. Nearly 20 minutes of music is provided.

For reviews see June '83 *Rainbow*, p. 192 and May '83 *Color Computer News*, p. 74.

COMPOSER (16K or 32K Cassette) $24.95
COMPOSER (32K Disk) $29.95

THE STEREO COMPOSER

The **STEREO COMPOSER** is a hardware music synthesizer that plugs into the cartridge slot of the CoCo. The **STEREO COMPOSER** contains two 8 bit digital to analog converters and two separate audio power amplifiers with separate volume controls to drive external speakers directly or your own home stereo system. The advantage of being able to use external speakers rather than the TV's built-in speaker is obvious. Using high quality D/A converters and two channels further increases music realism.

The **STEREO COMPOSER** comes assembled, tested, burned in, with all the necessary hardware and software and a 90 day warranty. All features of the **COMPOSER** software are included. You may purchase **MUSICA** and add even more features.

STEREO COMPOSER (Cassette or Disk) $69.95
STEREO COMPOSER (50 page manual for evaluation) ..... $ 4.00

PLEASE PIRATE THIS TAPE

Yes you read that correctly. In order to give you the opportunity to hear our products, we are offering you a standard stereo audio cassette. Over 30 minutes of music developed using the **COMPOSER, STEREO COMPOSER,** and **MUSICA** are included. Your announcer is of course the **VOICE**. So listen before you buy if you must and spread the word by copying the tape for a friend. This is an audio cassette for your stereo system, not a digital cassette for CoCo.

Demonstration Tape (Stereo Audio Cassette) $4.00

THE VOICE

The **VOICE** is a hardware speech synthesizer that plugs into the Color Computer's cartridge slot. It uses the sophisticated SC-01 by VOTRAX to reproduce any word in English as well as other languages.

The **VOICE** has two outputs. Speech may be heard through the TV speaker or the built-in audio power amplifier with volume control may be connected to your own external speaker.

The **VOICE** comes assembled, tested, burned in, with all the necessary hardware and software, and a 90-day warranty. Runs in 16K, 32K, or 64K machines.

BINGO The VOICE announces the BINGO tiles while you play the game.
MATH TUTOR The VOICE tutors your child in learning arithmetic.
HIGH LOW The VOICE gives you hints in guessing a number it has picked.
EDITOR This utility program will help you develop words phonetically.
THE VOICE (Hardware and programs above. Cassette or Disk) $79.95
THE VOICE (40 page manual for evaluation) ..... $ 4.00

THE TRANSLATOR

The translator is a machine language program that uses a sophisticated algorithm and exception table to automatically convert text to speech. For example, A$ = "THIS IS ALMOST TOO EASY" followed by calling a USR will allow the VOICE to speak. The translator will even allow you to type words in one language (i.e. French) and have the VOICE speak in another (i.e. German).

REACTION Test your reflexes as the VOICE gives you commands.
SIMON Test your memory for numbers spoken by the VOICE.
THE TRANSLATOR (With programs above, Cassette or Disk) $29.95

ESTHER

ESTHER is ELIZA plus. ESTHER illustrates the high level of artificial intelligence that computers have achieved. Perhaps you have heard of ELIZA that was developed at MIT in which the computer plays psychologist. In our version, the VOICE speaks just as the doctor would. And because it is completely machine language, responses are immediate. You'll be amazed!

* **ESTHER** (32K Cassette or Disk) $24.95

EDUCATION PACK 1

This package of 3 programs is intended for the pre-schooler.
ALPHABET The VOICE speaks the A, B, C's as they are displayed enlarged.
NUMBERS Enlarged numbers are displayed while the VOICE speaks them.
COLORS The VOICE teaches your child the basic colors.
* Educational Pack 1 (16K or 32K Cassette or Disk) $24.95

EDUCATION PACK 2

This package of 3 programs is intended for the elementary school child.
HANGMAN The VOICE adds a new dimension to this favorite spelling game.
SPELLING Test your spelling ability with the VOICE.
CALENDAR Test your knowledge of the days of the week, months, etc.
* Educational Pack 2 (16K or 32K Cassette or Disk) $24.95

EDUCATION PACK 3

This package of 3 programs is intended for grades 5 through 8.
STATES The VOICE tests your spelling ability of the states.
CAPITALS So you think you know the capitals, let the VOICE see.
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Bio-Detector — Not Too Probing

There are a lot of games you can buy for your CoCo for $35. Most of them come on a cassette, a disk, or a cartridge, and are played with a standard controller, such as a joystick. *Bio-Detector* is unique. Along with the cassette that contains the game software, you also get a cute little gadget that allegedly measures your "bio feedback."

"What is bio feedback?" asks the instruction sheet. To which it answers: "Bio feedback is the amplification of any function of your body. This allows you to be aware of something about yourself that normally you aren't aware of. The *Bio-Detector* measures skin resistance, which is inversely proportional to body stress and is displayed on the screen. This way, you can learn to lower your personal stress level.

At one end of the gadget is a cable that plugs into the left joystick port. At the other end are two probes that wrap around two of your fingers. The little black box, from which these emanate, contains a sensitivity knob.

When you *CLOADM* and *EXEC* the program, you will see a graphic menu on the screen that lets you select the speed of the Scope (fast, medium, or slow), the type of Trace (dots or lines), and two different Audio responses (or no sound).

When you have wrapped the probes around the proper fingers, and pressed ENTER to start the Scope in motion, you must then adjust the sensitivity control until the Trace is at the middle of your screen. In my case, it never moved up from the very bottom, indicating zero reaction. The only way I could get the program to register anything was to touch the two probes together. Somehow, that didn't seem right.

The instructions suggest that you moisturize your fingers with hand lotion. That didn't work for me. So I tried wetting the probes and my fingers with saliva. That made a considerable difference. Now I was able to get a reading without squeezing the two probes together. But the reading that I did get was more in reaction to finger motion than to stress.

My wife says that sometimes I can be very insensitive. So I tried it on her, with the same results, or lack thereof.

The unit plugs into a joystick port, and is read by the computer as a joystick, so it is theorectically possible to write BASIC programs for it by using the *JOYSTK* function. A short sample routine is listed that will sound a tone. "Higher tones mean higher stress," it says.

I keyed it in and tried it. Moving my fingers and turning up the sensitivity control produced lower tones instead!

My recommendation: Save your money.

(Computerware, Box 668, Encinitas, CA 92024, $34.95)

—Neil Edward Parks



Bumpers — A Maze Game With A New Twist . . .Or Bump

Bumpers is a maze game which involves competition between two players or you and the CoCo. The object *appears* simple enough. One must find a way through a maze before your opponent does. However, the maze is invisible and only by "bumping" into walls do you reveal its intricacies and potential dangers. The first one through the maze wins.

Initial set-up of the maze is under player control. You can determine the height and width of each maze cell, as well as the skill level from 1 to 4. Once selected, the maze is generated quickly and you and your opponent appear at opposite corners of the screen. Each tries to reach the opponent's corner through the invisible maze first. This, in itself, offers a sufficient challenge. However, two additional features have been added which enhance the play of the game. You can "mine" the walls of the maze by touching one and then pressing the button on the joystick. The wall, then, becomes invisible and anyone bumping into it is quickly whisked to another part of the maze. If two players meet on the same portion of the screen, the first one to push the button on the joystick gets to bump the other to another part of the screen.

The game is one of the few on the market in which two players interactively compete against each other in a game of skill and cunningness. If you like maze games and like to compete with an opponent or your CoCo, then this game is for you. Note—CoCo beat me convincingly at skill level four.

I cannot end this review without commenting about Mark Data Products. The tape sent to me by the folks at *Rainbow* would not load in my system. I placed a call to Mark Data Products and informed them of the problems I was having. I received advice on possible remedies and when these failed, I was told a copy would be mailed immediately. Three days later, I received the tape in the mail. The courteous, professional manner in which they handled my problem deserves recognition. As is apparent from the comments in *the Rainbow* and others, CoCo is blessed with many responsible professional venders and one can purchase their products with confidence.

(Mark Data Products, 24001 Alicia Pkwy., No. 207, Mission Viejo, CA 92691, $24.95)

—Bernard Roskoski

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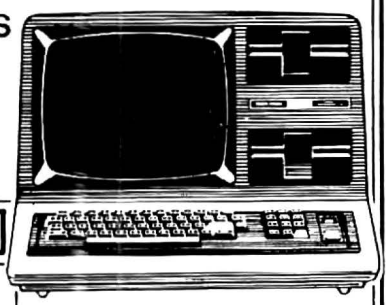
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C-TREK
Old Favorite — New Color

About eight years ago, the company I was working for bought their first small computer. This was an old IBM micro which cost about $20,000 and had no color. It was being wasted on such tasks as bookkeeping, payroll, engineering and the like. One day, one of the salesmen for IBM brought a new tape with a great game where I could rid the universe of the Klingons. That's what computers are for! This game has become a classic and has appeared in many versions for all computers. When I first saw the game for review, I thought it was just another version of an old game. *C-TREK*, however, is an improvement of the old classic.

In this game, as in the classic, the Enterprise, the Klingons, your bases, and the stars are represented with text characters (i.e., the Enterprise is an "E"). While this does not use the great graphics possibilities of the Color Computer, it allows this BASIC game to be played with any 16K CoCo. Extended BASIC is not required. The 16K is really packed because of the many features not included in the version I played before.

You start out with a fresh ship and are given your orders to destroy all of the Klingons in the known universe. While your ship is much better than any Klingon ship, or even two or three, you must destroy many more than this (a random number from 13 to 26). You also must carry out your mission in a specified number of moves (stardates) or the nasties take over. Everytime you try to maneuver to your base for resupply or to get a better torpedo shot at your enemy, you use up time. You must learn to use your two weapons (the phaser banks and the torpedos) properly. The phaser is a short range weapon which does damage, depending on the range and shield strength of the ships. The torpedo hits will destroy with one shot, but they must be aimed.

When you enter the sector with the enemy, they get the first shot. After that you trade shots and are allowed to try various sensors, computer data screens, and repair of important ship functions. Each hit on your ship does damage to your shield and will soon decrease the capabilities of each of the ship's weapon and data systems. That is where the real action occurs. You must plan your moves, save energy for shields, plot the course of torpedos, and still plan to be able to get back to your base to refuel. Remember to set shield energy before your first attack or you will get caught with your shields down and die instantly. Your commands to the various ships systems are all three letters. In the command mode you are met with any illegal key-in with a HELP screen, which gives all of the commands and their three letter key. Because the number of commands is limited, I do not understand why the author did not just use one, or at most two letter commands. Because this game is in BASIC and not protected from backup, it is easy to change the command file to something shorter. The original commands under the stress of the game are interesting because as you get caught up in the action, you start making more and more mistakes. I told several cadets at West Point (during a recent war games tournament) that not thinking under stress will kill. I proved my theory by dying while trying to type the proper commands more times than I care to admit.

In this game, I sat with my shield almost down to zero due to battle damage. No problem because I just added more energy to my shields. Then there was a hit on the shield control, <SHE>, and I could not add more energy to the shields. Still, all was not lost because I could go to damage control, <DAM>, and add more energy to the shield control. That was when I found out that the <DAM> Damage Control thing was lost during an early stage of the battle and I couldn't repair anything! If I warped out, the Klingons were allowed another shot at me and I might die. A switch to short range scan <SRS>, and I found that a Klingon moved out of the cover of the star! So I used a torpedo shot at him. Now, is that direction 7.6 or 7.4, or maybe 7.3 would be better or . . . or . . .

The only negative comment I have for the game is the documentation. While the printed version is attractive from a distance, the number of typographical and grammatical errors make it appear rather crude. These mistakes do not cause any problems with understanding the program, but they should have been caught by any proofreader.

This game is beatable. I know it is because over the weekend my friend beat it, although I haven't yet. If you like war games I think you will like this one!

(Spectral Associates, 141 Harvard Ave. Tacoma, WA 98466, $11.95)

—Tom Roginski, Ph.D.

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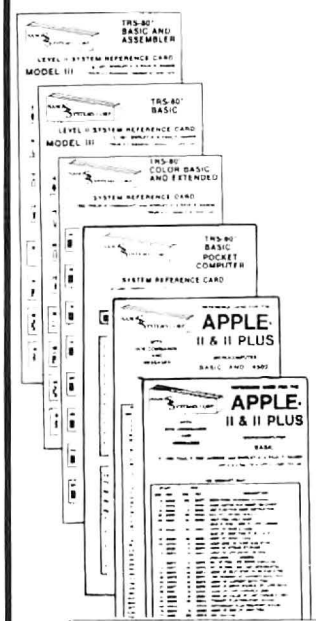
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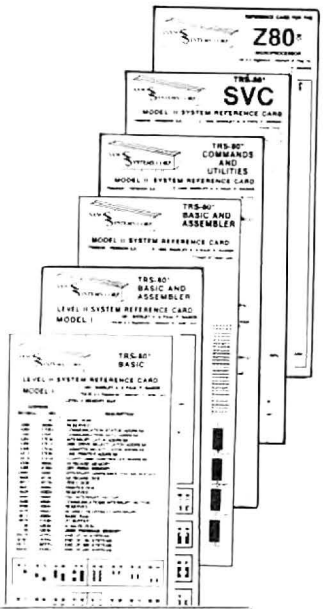
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Another publisher puts out a large full-sized plastic sheet which is so technical that even NANOS himself cannot understand it all!

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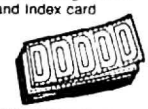
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Pritty Printer: Close, But No Cigar!

(Hum the introduction to the Twilight Zone). Submitted for your approval, a simple little program. One that tries to fulfill the ultimate goal of every hacker. A listing of a BASIC program, with all statements and functions on separate lines, each line indented from the line number. And all bundled up with a heading on each page. It calls itself *Pritty Printer.*

Pritty Printer will take a line like this:

```
20 P1=1:LL=70:PL=66:DS$="Y":DF$="N":SW$="N":
                    DA$="":LD$="Y"
```

And digest the jumble of tokens and ASCII to produce the following:

```
20   P1=1:
     LL=70:
     PL=66:
     DS$="Y":
     DF$="N":
     SW$="N":
     DA$="":
     LD$="Y"
```

This output is achieved simply. *Pritty Printer* consumes a BASIC program that has been saved in the ASCII format. It then takes this information and begins to break up lines with multiple statements.

First, it hunts out the colons; when one is located, a carriage return is appended. This process is repeated for the entire program. Next, a check is made on the current printed line. *Pritty Printer* will automatically format each page and skip over the perforations (perfs being the vile things that they are). Each page is headed with the name of the program and date, if you so desire. The output is very clean and attractive.

Alas, *Pritty Printer* is not without flaws. And it is these flaws that cause me to hold back on the praise.

I feel that programs such as this should be in machine code. This way you can have the program you are looking at in memory. No need to re-save a program in ASCII and clutter things up. There are some very good co-resident pretty listers out there. Machine code shouldn't be too much to ask.

My second reservation is on price. I think that a program that digests ASCII (and not that quickly, either) should be in a lower price range. In fact, if you dig around a little, you will find a similar program listed in *the Rainbow!*

In final retrospect, *Pritty Printer* does do a pritty good job. I would rather spend the same money on a machine code program.

(Spectrum Projects, 93-15 86th Drive, Woodhaven, NY 11421, $19.95 plus $3 S/H disk/tape)

—Walter Seay

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A file with two addresses and some supplementary information typically would look like this:

1 John Q. Doe
2 6809 CoCo Street
3 Rainbow City, USA
4
5 Jane Q. Buck
6 80 Epson Blvd
7 Tandynia, USA
8
9 Note: (These addresses are representative of the increasing numbers of persons discovering the capabilities of the RS Color Computer.)

Each number above is a separate record.

The program lives up fairly well to its billing of "user friendly." The documentation (instructions and general information) is well organized and appears complete.

However, the program's versatility is extremely limited. Since each record is entered as a string, data cannot be separated by commas or colons. The program cannot sort or search; once records have been entered, they can be retrieved only by specifying a particular data "line" (which can be up to 249 characters, about 40-50 words) or by reviewing the entire file on the screen fifteen records at a time in the order entered. If the fifteen items exceed screen size, the top lines scroll off the screen and only the bottom fifteen lines appear. The same potential problem exists in the replacement routine.

The print format is limited to a listing of the record numbers and their content. The author warns that choosing the print option on the menu without the printer being on will require a reset of the computer. This could easily be eliminated by having the computer *PEEK* at the printer status and returning to the menu if it is not on.

With a little work, its usefulness could be increased. For example, by entering null records to create the necessary line feeds, (as in No. 4 above), the print routine might then be used as a label writer — *if* you don't mind having numbers in front of each line. Perhaps you might add routines to sort, to strip line numbers off for printing labels or to detect when the printer is off.

If your needs or computer capacity are limited to a simple, easily-usable program for storing lists, recipes, inventories, notes or general information without the need to retrieve or use that information in any order other than the way you put it in, you might find *Database 500* useful if you find it at a bargain basement price.

You might also find this to be a good program for learning about basic information-handling routines. In fact, it is the kind of thing you might expect to find in a collection of introductory or instructional programs. As software standing on its own, however, it is something we might have expected a couple of years before the current level of sophistication was reached.

If you need real information handling on a tape system, and are prepared to spend a few dollars more, you should be taking a look at something like *TIMS* (Tape Information Management System) or *FILMASTR* ($25-$30). If you have or expect to have a disk system, cast an eye not only at *FILMASTR* but also at the other database management utilites now appearing on the market, such as *Homebase, Pro-Color-File, Flexi-Filer* and *Super Color Database* ($65-$80).

(Litefrac Software Inc., 2002 N. Magnolis, Tuscon, AZ 85712, tape $12, 16K)

—Warren S. Napier

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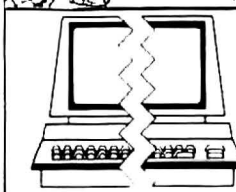
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Computer Shack Release Out Standing In Its Field

Outhouse, from Computer Shack, is one of those rare arcade games that you can love. It has a unique personality all its own and is a completely original concept. That, alone is enough to recommend this 32K machine-language diversion in these times of clones and repeats of coin-operated games.

The premise is simple enough. You, (the player) are the guardian of the outhouse. You hover overhead in your sleek flying saucer, which is equipped with a Mark VII Toilet Paper Snatcher Zapper. There is also a Vertical, Horizontal, Diagonal Squatter Stopper. Both these laser-based weapons are designed to teleport to jail (somewhere off screen) two kinds of antagonists in the game, those who take paper and those who occupy the outhouse without permission, each of which garner off points until you can zap them.

There is more. Hostile UFOs try to zap you from the sky. They distract you while the villians do their dastardly deeds. If you hit an outhouse or touch one of the opposition, KABLOOIE! Bye-bye, you.

This cute little game is one answer to that obnoxious question, "But what can the computer DO?" One trip to the *Outhouse* and they won't be asking questions for a while.

There ought to be an award given for eye-pleasing packaging. Any retailer would declare he'd gone to heaven for sure with the Computer Shack visual presentation.

Everything about this game is right. Joystick response is clean and smooth. Internal, (on screen) graphics are crisp, colorful, functional and enhancing to the game. The sound won't drive you into rubber ranch retirement. And despite the hint of wry bathroom humor, there's nothing about *Outhouse* that your three-year-old or Granny could object to.

Outhouse is a winner. Four Stars for originality, playability, visuality and pure genius in total presentation. The only complaint I had was that the darn package didn't have a hole in it so that I could put it on a pegboard hook. If you like arcade games, but are sick of monkeys, ghosties, and things falling on your head, then you might like to sit down and enjoy a copy of *Outhouse*.

(Computer Shack, 1691 Eason, Pontiac, MI 48054, $27.95 tape, $29.95 disk)

—Bob Liddil

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Mailing List Gets The Job Done

Here's a good, basic, mailing list program that prints labels, envelopes, phone number lists and has exact documentation. That's how I felt after working with Prickly-Pear's *Mailing List* program. But this program also runs a machine language program that sets your screen to high resolution for full upper- and lowercase, in your choice of green or white background, with a 42-character sentence. While the documentation seems to mention the High-Res screen in a casual by-the-way attitude, I feel that Prickly-Pear should have used a banner headline. I really liked the size of the letters and numbers, with both the upper- and lowercase characters. I have had some problems with reading the screen on some other High-Res programs, but the 42-character design chosen for *Mailing List* worked quite well on my Sylvania 13-inch TV. You have a choice of either a "light" or "dark" screen. I preferred the dark screen, as it was a little easier for me to read.

The documentation states that the instructions are "truly user friendly" and I agree, although, just as with any utility, you have to get used to working with it. I have a mailing list service and I am familiar with this type of program. *Mailing List* is a " . . . random access filing system which can handle up to 1500 records with six fields in each record." To be honest, I did not try to load in 1500 files with six fields for each record to verify this statement. This time we will have to take their word for it. I did try out all of the features of the program and found only one problem that was not mentioned in the directions. If you are using upper- and lowercase letters you must use the [SHIFT] to enter commands (ie., The program prints "All correct [Y/N] or [COPY]" and you must press shift Y,N or C). If you are using all capitals (uppercase) there is no problem.

Mailing List is set up for Radio Shack's DMP-200 but I did not have to make any line changes for my Okidata Microline 82. Prickly-Pear lists line numbers for high-speed pokes, label print routines, and ZIP code order change. I would have appreciated the line number for *Print #-2* statements although it is not that difficult to look through the program if your printer does not follow the print routines.

After the lead question, "Are you loading a new file [Y/N]," the program asks you if you want the light or dark screen. It alternates between the two until you decide. You are then given the choice of continuing or aborting the program. If you abort, you can start the program over again with a different screen, or change your answer to the lead question. Following this, the main menu comes up with seven choices: 1) start/add to list (name—30 characters, address—30 characters, city/state—30 characters, ZIP—12 characters, phone—12 characters, code field—5 characters); 2) review/edit list (for reviewing, correcting, or copying to printer for label or envelope. This also has a record search with string, record, ZIP code or individual search); 3) print all records (single or double wide labels); 4) print particular records (search routine); 5) print phone numbers (single line print of name and phone number only); 6) load new file (start a new listing); 7) end program (returns to BASIC but stays in High-Res screen).

There are special instructions for alphabetizing and the documentation does a good job explaining the procedure since you have to use the "alpha" program without the High-Resolution screen. Prickly-Pear explains that a file of over 1000 records will take several hours since the program reads and writes to disk thousands of times (That's how they can have up to 1500 records) and they recommend letting the sort run overnight.

My conclusion of *Mailing List* is that it is a fine program and does what it is supposed to do.

(Prickly-Pear Software, 9234 E. 30th Street, Tucson, AZ 85710, $49.95)

—Michael F. Garozzo

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Federation Boot Camp Quickly Becomes Repetitious

As I sat at my computer terminal one day lamenting how boring life had become in the "age of the federation" I found myself longing for a new challenge. The year was 4931 in the galactic age and there just wasn't much left in the way of new frontiers. Suddenly the screen before me sprung to life, as it often does, to deliver some mundane message. But wait, this is something I haven't seen before . . . drafted!! I had been called for duty in the Galactic Space Federation. Among other things this meant that my first stop was Federation Boot Camp, a grueling 16 week course of instruction in space combat and navigation. This is the scenario for *Federation Boot Camp*, an arcade game program from Carl Shell, written by Bob Schmerling.

There are two versions of this game, a 16K program and a 32K program. The only difference between the two is that the 32K version uses a higher resolution mode. The 16K version is a little more colorful but both are pleasing to the eye.

The game consists of four different tasks on four different screens. Successful completion of the four tasks four times in a row allows you to graduate as a space cadet. Each pass through the four tasks is more difficult than the last. Each task is a relatively unsophisticated mini-game (note I said unsophisticated, not easy) that involves completing an assigned task while using a minimum of fuel.

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The first task is called "trajectory" and is essentially a guessing game in which you input ranges to a target, bracketing it until it is hit and destroyed. Task number two, called "star maneuver," is a maze of asteroids that you must successfully navigate through, avoiding collisions and the droid which chases you and attempts to destroy your ship. Successfully docking at the base at a minimum speed without any collisions will move you on to the third task. The third screen is called "mine scanner" and involves moving through a grid without backtracking or crossing your own path while avoiding the mines. A scanner is provided to help determine the positions of the mines; but be careful, your own accuracy affects whether you get to see where *all* the mines are. Task four is called "hyper track." Here you use the joystick to steer a course through space. You must stay between the boundaries of the track in order to increase your speed to a certain required minimum before fuel runs out.

Failing to successfully complete any of the tasks will result in your being kicked out of the federation. However, you are given the choice of whether or not you wish to try again.

Documentation for *Federation Boot Camp* is good; every aspect is explained fully. There is no doubt left as to what is expected of you. Packaging is nice; the cassette comes in an attractive book sized box.

Although initially intrigued with the premise of this game, I soon became aware that this was really just four rather simple games strung together to create a longer game. It becomes repetitious too soon and just doesn't live up to the quality of other arcade-type games that are available for CoCo. The graphics demonstrations between scenes are pretty, but I soon found myself waiting rather impatiently for the next task to begin. All in all, I would have to say that this one will probably stay on the back shelf most of the time.

(S&S Arcade Supplies, 8301 Sarnow Drive, Orlando, FL 32807, tape $18.95)

—David Johsnon

Hint . . .

Incremental Advice

Most 6809 machine language programmers are familiar with, and take advantage of the 6809's capability for automatically incrementing by 1 or 2 the base register used in the register offset addressing mode. They know that the incrementation is accomplished after the effective address has been determined. However, some may not realize that the incrementation takes place *prior* to execution of the instruction. That is, for example, if we have the two steps:

```
LDX #$400
STX ,X++
```

many would expect the value $04 to be stored at $400, and $00 at $401. While $04 will be stored at $400, the value $02 will appear at $401, because the value of the X register is incremented twice after the address to which the store will go has been determined ($400), but before the store instruction is executed.

For automatic decrementing, there is no such ambiguity, since the register's contents are incremented prior to the address being determined, and therefore also prior to instruction execution.

—Major Richard D. Benton, USAF
Seattle, WA

Software Review

Alphabet Is As Easy As A, B, C!

Alphabet from CY-BURNET-ICS is a great game/learning program for preschoolers. It is good to see good quality software being developed for small children and especially for educational purposes. This is a colorful educational tool that is easy to use, and preschoolers can learn as they play.

Alphabet was not designed to be a game in that it does not keep score and does not scold for wrong answers, nor does it actually give any praise for the right answers given. Our five-year-old could already recite her alphabet and could sing it even better, but *Alphabet* reinforced this knowledge and increased her skill of letter recognition and letter placement. The objective of the program as stated by the creators " . . . is to teach the alphabet through letter recognition in and out of sequence by using a variety of exercises . . ."

Alphabet is written for the 16K Color Computer with Extended BASIC. It is a machine language program and comes on a cassette tape with two copies of the program. One program uses the speed-up *POKE* and the other does not, so this can be used on older models. It has an auto-load feature which gives you something to look at while the program is loading. Soon, you are prompted with a menu giving six exercise options. My preschooler, of course, cannot read the menu, but after playing several times became aware of the "number" of the exercise she liked to play.

The six exercises use visuals in the form of graphic letters to teach the alphabet by letter recognition. The first exercise utilizes an audible alphabet (already pre-recorded on the program tape) to coincide with the visual alphabet. Using the recorded voice does require special instructions to your child. While the recorder is in the play mode, the child cannot respond until the computer turns the cassette off. I simply told my preschooler to listen for the click that is heard when the computer turns the cassette recorder on or off. This is a great exercise to teach young children the alphabet. The second exercise is the same as the first without the voice option.

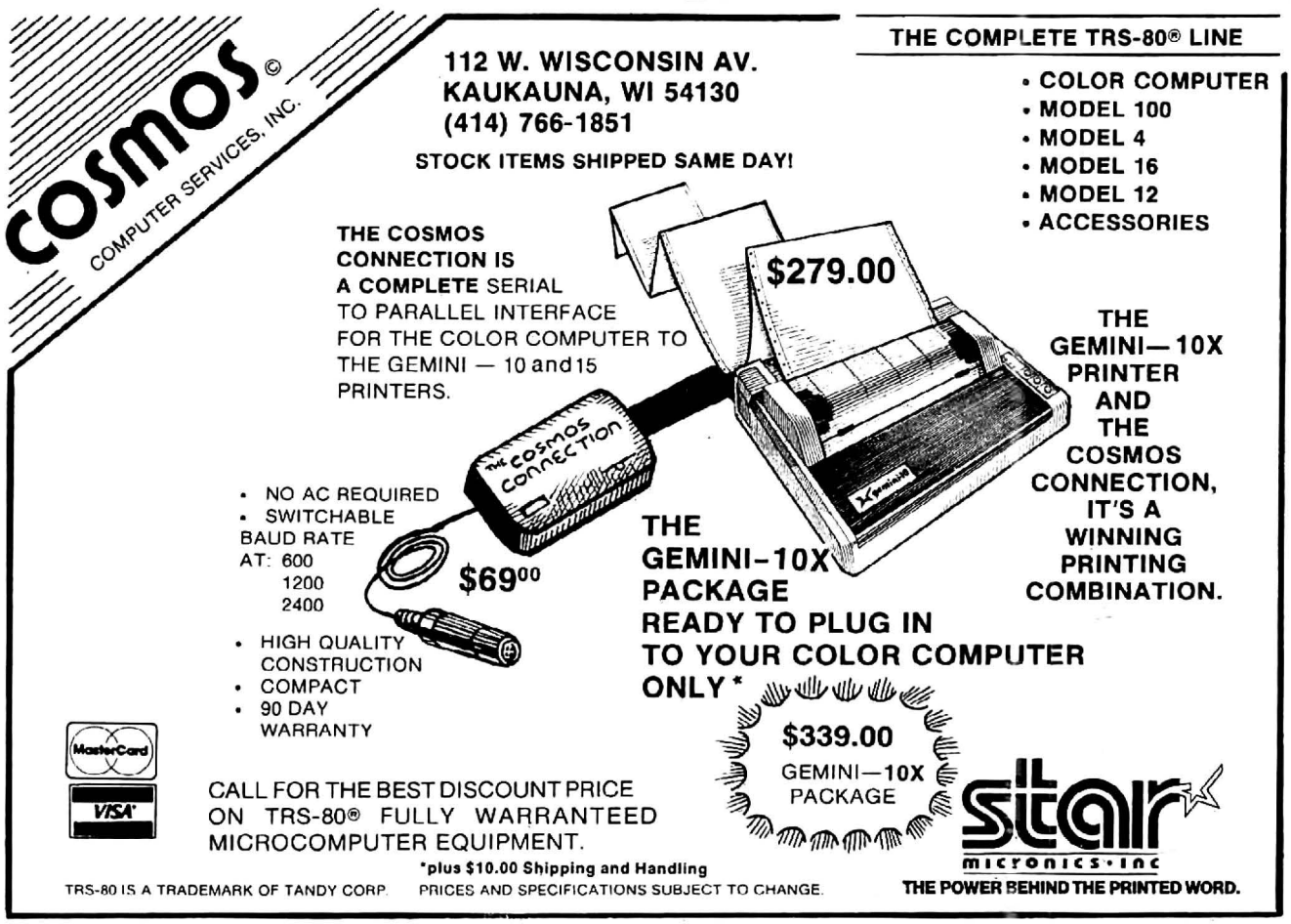
The next three exercises help to reinforce the learning of the alphabet. They use the "next letter" approach by giving the student a letter, either in sequence or at random, and instructs the student to give the next letter. By giving the letters at random, the exercise helps to develop letter recognition speed and letter placement. This is good for older preschoolers or first-graders.

The last exercise is the most advanced in this basic educational tool. The program lets the computer select 22 non-repeated selections of five letters in sequence, with one letter missing. The student selects the missing letter. As in all the exercises, the program advances only after the appropriate key has been pressed.

This is a fine educational tool for small students. It has all the features one should expect from any advertised software. The documentation is complete with loading instructions, program operation, and ideas for special adaptations. Besides the teaching of the alphabet, it allows small children to use the computer. I would also like to add that this would be a great program for special education students and slow learners of any age.

(CY-BURNET-ICS, 5705 Chesswood Dr., Knoxville, TN 37912, $24.95 on tape)

—James D. Ray



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2Fer One — An Interesting Bargain

Two games for the price of one is implied by the title *2Fer*. *Gandola* and *Copy-Cat* are the two games included on this 16K Extended BASIC cassette.

Gandola is played by maneuvering a low resolution graphic balloon over a mountain and between two pine trees. A simple procedure which proves to be quite a challenge, when the wind factor kicks up. Gravity continues to attract the navigator to the earth while the iron clouds above the mountain attempt to drive into the easily punctured rubber lining. The balloon's pilot must combat these forces to conduct a safe landing at his destination. Using only keyboard action, the automatic repeat format is unavailable to the aviator. This feature adds adventure to the navigating task while exhausting fingers and keyboard.

The computer takes on human identification when *Copy-Cat* is loaded. "Me" and "You" square off to do battle. Can the computer perform a pattern of flashing squares that "You" cannot follow? The contender attempts to mimic the computer's lead. Only one level of play is provided in *Copy-Cat*. The patterns prove difficult, eliminating the possibility of repetitive competition.

All of the action takes place on the keyboard in both games. In each case, a joystick could have been used to provide better control of the action, and an option for choice of play would have made the games more appealing. However, the keyboard action is amply explained.

These two amusements are favorably presented and the instructions are well-diagrammed.

Gandola's theme could have been elaborated upon to produce a more thrilling game; it is interesting, but readily becomes repetitious. *Copy Cat* is fun to play, but it may be old stuff to many computer challengers. Together, however, Mr. R has provided a rather interesting bargain twosome.

(Mr. R's Software, 68 Kelly Rd., So. Windsor, CT 06074, $9.95)

—Loretta Jessup

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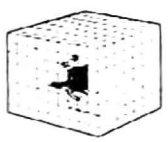


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Reviewer Finds Lowercase Program Of Dubious Value

The Color Computer is the apparent survivor of the pack. And, as such, we are seeing a veritable spate of new products hitting the market to satisfy our thirst for utilities and applications software and even hardware designed to make our CoCo sit up and shine. Luckily, most of the new releases are quality, useful products. Still, despite the services of magazines like *the Rainbow,* which offer reviews to give you our opinions and guidance on the relative worth of those products, especially software, it's still a "caveat emptor" or buyer beware world. All is not really worth what it's cut out to be.

Take for example this software-driven lowercase kit for owners of Radio Shack's Line Printer VII and DMP-100 called *Lowrcase.* Now, we all know that venerable printer doesn't have true descenders, those nice squiggly tails on the g, j, p, q and y characters in lowercase. We also know that the LP VII is painfully slow with its unidirectional, 600 bps, 90 byte buffer scheme. But, when we bought it over a year ago, it was the most we could afford and still keep peace and harmony in the household. Without it, many of us would not enjoy the many benefits a printer affords the hobby computerist.

When I invested in my LP VII (on sale at $299 over a year ago), it was to give me some means of listing programs to paper for debugging and record copy. I envisioned little use of it for word processing because of its relatively poor character set style. The lack of true descenders meant that any printouts were strictly for in-house use. I knew what I had and accepted it. It took me a while to get used to those pseudo-descenders, but I did. No big deal until I needed better quality—for which I simply saved my pennies.

I know, I'll probably be accused of not giving this package a fair shake. So be it. I'll say it right up front, though. I don't think KRT Software's *Lowrcase* for the LP VII and DMP-100 is worth the money or the effort considering the product delivered. They're now marketing a piece of software (actually two programs) which will supposedly let your LP VII or DMP-100 rival the "bigger" dot-matrix printers with true descenders.

The package comes on cassette tape with two programs, *Chrout* (machine language) and *Lowrcase* (in BASIC). The *Chrout* program modifies any machine language program in memory to print using the BASIC character output at Hex A2BF, says the accompanying sheet. This is the one which lets you use your printer and get true descenders under *Lowrcase* with *Telewriter-64* (Cognitec) and other machine language programs. It's designed for Extended 32K and 64K tape or disk machines with version 1.1 BASIC. (Take note that it was not tested with 16K machines.)

The program which actually delivers the lowercase descenders for those five little letters with their tails (g, j, p, q and y) is *Lowrcase.* With it you can pin the tails on under "most" BASIC word processors and any machine language processor using ROM print routines as well as the *PRINT#-2* command directly in the immediate mode.

Enough of that, though. What will you actually get for your money if you decide to turn it loose?

This program uses Extended BASIC's graphics features to draw the tails for reproduction by the dot-addressable printer. That's as basic as I can put it. To do so, the printer must produce 80 columns of print and then on the next line append the descenders. Yes, in order for it to work properly you must in essence double-space your printouts. The software takes care of the double-spacing. If you don't double-space, minding your p's and q's as it were, you won't have a leg to stand on and the descenders are lost completely.

There it is. That's all there is to it! Ain't no more! I didn't even bother to try this with *Telewriter-64* (thereby probably leaving myself open to criticism). At 600 pbs, the LP VII can be painfully slow if you're waiting for it to finish a listing or other printout of any length. Add to that this program's scheme of using the next line to "pin the tails on" and you increase print time by a factor governed by the number of g, j, p. q and y characters in your text.

Is it worth it? Not in my opinion. Save your money. Sorry, fellas. Glad you tried, but this one still won't get the printout past the editor or the test grader.

(KRT Software, P.O. Box 41395, St. Petersburg, FL 33743, tape $15.95)

—Ed Lowe

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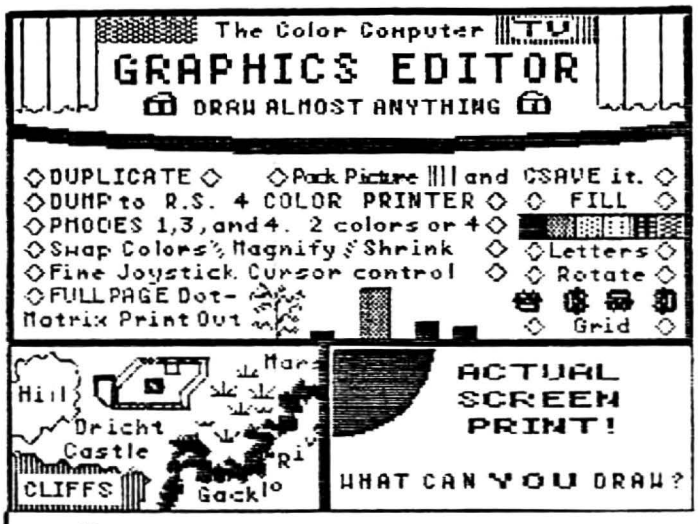
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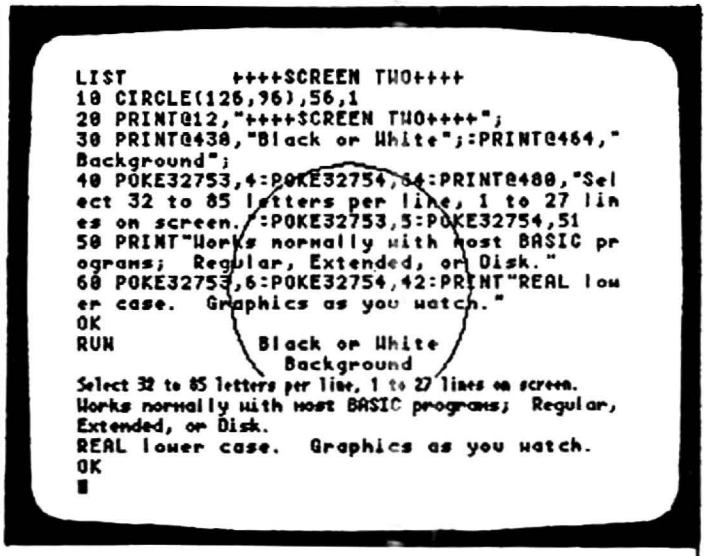
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CCADS is a machine language software development monitor for the CoCo. Features included are a 6809 line assembler, 6809 disassembler, Hex and ASCII memory dump and memory alteration routines. Execution of user ML programs is controlled with user selectable breakpoints.

The program is written in position independent code and, therefore, may reside anywhere in memory. It consumes 6,993 bytes of memory for itself and the scratchpad area ($0F00-$2A50).

All numeric input is done in hexadecimal (*not* decimal) format and the user needs to exercise caution so as to not overwrite *CCADS* memory area.

The dump memory (DM) command outputs memory contents between user specified address range, in both Hex and ASCII representation. The output is a neat format of eight memory locations per line, the Hex values followed by the ASCII code. Scrolling is rapid across the screen but may be suspended and restarted by hitting SPACEBAR.

Memory examination is done with the EX command followed by the address to be examined. The output shows the address and its contents, again in Hex form. The contents may be readily changed by typing in the new value desired, then the next address is displayed. To backstep, the minus key is used and examination terminates with the left arrow key.

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All the 6809 registers may be changed (except DP and CC) with the fill register (FR) command. To view the contents of the registers, typing RG will display on one line all the internal information.

Blocks of memory can be easily relocated with the move (MV) command by specifying the "form" address, "to" address and the number of bytes to be moved. (*CCADS* can be relocated by using the MV command.)

Disassembling an existing program or the CoCo ROMs is done with the DS command. All branch and JMP instructions are given in absolute, not offset, form. That is, the exact address of the "branch to" is given. However, all PC relative and index register offsets are given in two's complement form. This does have its drawbacks. Read on.

The assembler is a one-line assembler. This means that no symbolic names (labels) are allowed. All branches and jumps must be calculated by the user, the assembler will not compute them. Also, all branches and PC relative instructions must be in absolute, not offset, form. To complicate the matter further, the absolute values must be in two's complement form. This is no problem if the value is positive. But if the value is negative, calculations begin. For example, the instruction STA 2,X in *CCADS* would be STA $0002,X. But the instruction STA -2,X in *CCADS* form must be STA $FFFE,X. If you don't understand the conversion of binary numbers to their two's complement form, then you have a real problem. (The conversion to two's complement form is too big a topic to try to over in this review.) If the disassembler encounters an STA -2,X instruction, it, too, will output the two's complement form of STA $FFFE,X.

Except for the above limitations, the assembler works well. After assembling the program, the user must set a "breakpoint" with the BK command to specify where the program ends. (Five additional breakpoints may be set within the ML program for debugging purposes.) The program is then executed by giving the GO command followed by the starting address. Upon completion of the ML program, all user registers are displayed. To clear breakpoints, type CB.

The output device may be specified as being the screen with the SE command or the printer with the PE command. The printer's Baud rate is easily set with the BA command (BA 2400 would set the Baud rate to 2400).

If your main desire is to write ML programs and you need a strong assembler, then *CCADS* is quite limited, but as an ML examination and debugging system, *CCADS* is useful.

(Chroma-Systems Group, P.O. Box 366, Dayton, Ohio 45420, 16K or 32K, $19.95 on tape, $23.95 on disk)

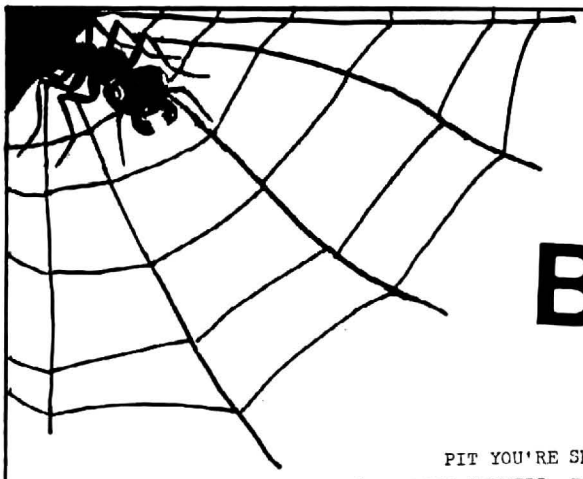
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Statement Writer
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A succession of generations of college students have labored over the textbooks and ledger sheets as they attempted to master elementary accounting (double entry bookkeeping). It is a difficult concept, but once you've mastered it, you wonder why it took you so long. After reviewing *Statement Writer* and *Disk Double Entry* (several years after receiving a master's degree in business administration), I am now aware of how much easier it could have been —and can be for today's students — to set up accounts, enter transactions, reconcile accounts, generate reports, statements and mailing labels. And all of this can be accomplished without the pile of pencil eraser residue common to freshman accounting. Needless to say, the same features make these two programs very attractive to the small business owner or the small club, organization or league treasurer or the entrepreneur who wants to keep their "books" for them for a fee.

Statement Writer is a utility program that provides enhanced account maintenance, statement generation and mailing for another program marketed by the same vendor, Custom Software Engineering. The main program is *Disk Double Entry (DDE). Statement Writer* works only with *DDE — it is not a stand-alone program.* It was reviewed by Lonnie Falk in the January 1983 *Rainbow*. For those who began subscribing after January, or who otherwise don't have access to that review, I will briefly summarize the features of *DDE.*

DDE requires that you have an understanding of double entry bookkeeping. You don't have to be an accountant, but you must understand what asset and liability, and income and expense accounts are; how to debit and credit accounts, what a trial balance, an income statement and a balance sheet are; and how to close the books. *DDE* is a menu-driven general ledger program that uses error-trapping techniques and is extremely user friendly. It requires 32K with Disk Extended Color BASIC. Armed with these requirements, you can handle approximately 300 accounts and about 1,400 transactions in a single drive system. The actual number of accounts depends upon how many heading accounts (e.g. "cash") and "total" accounts (e.g. "total assets") that you use. These are considered to be accounts by the program but obviously cannot be used in the normal sense of an account. The program allows you to set up accounts, enter transactions and generate reports (transactions, trial balance, balance sheet and income statement). In his review, Lonnie was impressed with the program's ability to handle dates, a unique method of closing the books during the course of an accounting period and was particularly impressed with the ease of entering, commenting and updating transactions. So am I! It is difficult to make a transactional mistake using this program.

You may be wondering why I'm spending time on *Disk Double Entry* if this is a review of *Statement Writer.* Well, without *DDE* there is no need for *Statement Writer.* Making a purchase decision on *Statement Writer* without understanding *DDE* would amount to buying a pig in a poke. At the end of his review in January, Lonnie noted that *DDE* did not include an accounts receivable or an accounts payable module. The folks at Custom Software Engineering were listening and now there is *Statement Writer (SW).* This enhancement to *DDE* is also menu-driven, uses error-trapping techniques so that mistakes won't creep into your work and is extremely user friendly. The program is supplied on tape with instructions for saving it to disk. It uses only the accounts that have been created by *DDE.* All input of transactional data is still through *DDE. SW* allows you to enter account information (this is usually the name and address for the account) that is used only by *SW,* while still maintaining all of the transactional and comment data entered through *DDE.* The addition of this capability allows for statement generation and billing of customers. It even allows for the generations of mailing labels. An enhanced summary transaction report may also be printed out with *SW* for those accounts visible to *SW* showing both account activity and current status.

You must designate which *DDE* accounts are to be used by *SW.* Only those *DDE* accounts will be visible to *SW.* You begin by selecting "account maintenance" from the *SW* menu. This allows you to add, change or delete the *DDE* accounts that will be used by *SW.* If you add new accounts while using this option, they will be available for both *DDE* and *SW.* You may add up to four lines of information (e.g. name of person, company name, street address, city/state

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address) containing no more than 62 characters each. Statements are generated on an 8½ x 11 page with the account activity at the top (opening balance, transactions, total charges, total payments, closing balance) and the balance due or credit amount at the bottom. You may select a starting date for the transactions that will be included in the statement. Your company name and address are printed at the top of the statement and also at the bottom, where the customer is told to "Please Pay To:." You are instructed on how to insert this data in the *SW* program. This option also allows you to input a message at the top and one at the bottom of each statement (e.g. "January 1984 Invoice" and "We Appreciate Your Business"). The program will not type statements for heading or total accounts or accounts that have zero balances or have had no activity during the statement period. It will, however, print a statement for an account with a credit balance, with the welcome message at the bottom, "No Payment Due." The account summary option allows for the printing of an enhanced account summary for all or selected accounts visible to *SW*. Addresses for the accounts may be included and you may also input a one-line comment to be printed at the top of the summary page. Mailing labels are printed using the same information as requested for the statement option. Labels are only produced for accounts for which statements are produced.

The documentation for *Statement Writer* consists of six, standard size, single-spaced, typed pages stapled together. The documentation does a good job of explaining the operation of the program, provided, as it points out, that you are familiar with *Disk Double Entry*. The program performs as described.

The real power of both *DDE* and *SW* is the ability that has been designed into both programs for user modification. All of the variables are explained in the documentation and examples are given of modifications necessary to achieve a suggested result. While *Statement Writer*, as supplied, amounts to an accounts receivable program, it is possible to modify it to create an accounts payable system — and this is suggested in the documentation. Two full pages of the *SW* documentation are devoted to customer modification of the program.

The price for *Statement Writer* is $34.95. The price for *Disk Double Entry* is $44.95. I would have expected that previous owners of *DDE* would have been given an opportunity to upgrade to the enhanced version of *DDE*. There is at least one major reason for providing separate programs — not all small businesses and clubs and other organizations interested in this kind of program send out bills to customers. If you don't need the enhancement, you don't have to pay for it just to get the capabilities that you do need. However, for $80 a small business owner or a small organization can purchase a versatile general ledger program with accounts receivable and accounts payable capabilities. I have seen similar programs for other systems that cost twice as much and don't deliver as much as *DDE* and *SW*. Now if only we could squeeze in a payroll program!

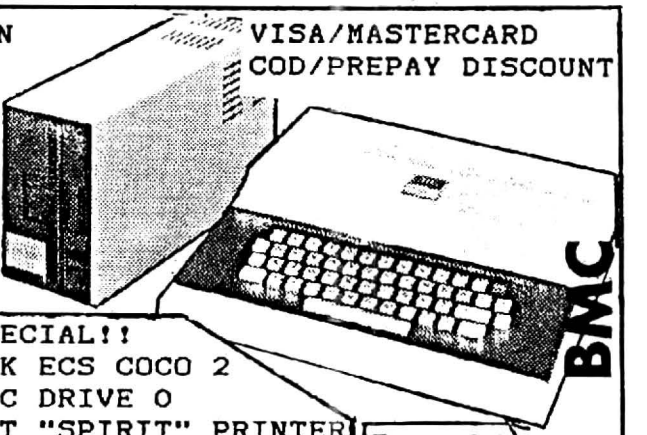
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CC-DBM/LW — A Letter Perfect Correspondence System

If you've had your CoCo for any period of time now, you are probably getting tired of just playing games. Sure, you know that your computer is capable of much more, but what kind of things would you like it to do for you? Maybe you belong to a computer club and need some help with mailing out newsletters and the like, or perhaps you are contemplating the big job of mailing out all of those seasons greetings cards. Can you think of anything now that you would like your CoCo to help you out with?

CC-DBM/LW is a set of programs, written in BASIC, that will allow you to maintain a database, create and edit letters, print name and address labels, and merge your database with a letter for mass mailings. It is designed primarily as a correspondence system, but can also be used for other purposes as well. It is not, however, and does not claim to be, a full-blown database or word processing system. With this in mind, let's take a closer look at some of the details.

The system consists of three distinct functions. The database/mailer portion allows you to create and maintain your database, print a record, display a record, print name and address labels, and sort your database on any field. The letter editor portion allows you to enter and edit your letter, and to print your letter. Finally, the letter printer portion will allow you to scan your database file or letter, set limits on the printing, and merge the letter with a database file for mass mailings.

The first thing you will have to do when setting up your database is to define your parameters. You must have at least four fields, and can have a maximum of 10 fields. Each field, in turn, can be between five and 27 characters in length. The system has defaults for all of these values, which in effect set up your database as a name and address file (what this system is all about). Once you are through defining your file, you are ready to start entering your data. There is nothing fancy about this process, and you are kept informed as to the record number being entered, as well as the number of records that can still be entered before the file is full. You can get from 68 to 454 records in your file on a 32K machine, depending on how many fields you have and their total length.

Once you are done entering your data, you can then save your file. You can also sort it by any field, print any record, as well as change or delete a record. Printing name and address labels is also a possibility at this point, and there are several options to choose from. You can set tabs, the spacing between labels, the number of copies to be printed and print a test label with Xs in all four corners, in order to insure proper alignment of the labels.

Now that you have set up your database, you will probably want to write a letter to send to all of your friends. The letter is automatically initialized with your name and return address (after you have *EDITed* a few lines in the program), as well as the opening and closing salutations. These, of course, can be changed, but it is nice to have CoCo do most of the work for you. The letter can contain up to 30 printed lines, with a line width of 70 characters, which includes word wrap. There are no fancy editing commands here, and it is very similar to BASIC's editor. Once you are satisfied with your letter, you can print a test copy of it, or just save it out.

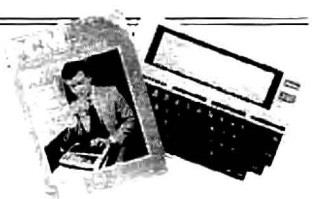
Now that you've spent what seemed to be an eternity entering data into your computer, you are ready for the big payoff. Load your printer up with paper, select the letter you want and the database to be used, and begin. Finally, your computer is performing a useful and tedious job for you, while you sit back and relax. Way to go CoCo!

CC-DBM/LW is a very good utility system that fills a real need. It is not full of extra features that you would probably not use anyway, and as such it is straightforward and easy to learn to use. It comes with several demo files, so you can start to learn how to use it as soon as it is loaded. The documentation is complete and explains how to use the system, but there could have been a bit more in the way of examples. One of the unusual features of the documentation is the inclusion of a flowchart of the major logic of the database portion of the system. If you are in the market for a full-blown database or word processing system, then you should look elsewhere. If, on the other hand, you are looking for a system to give you a hand with your correspondence, then *CC-DBM/LW* will do the job nicely.

(EVS Engineering, 9528 Suite 35, Miramar Rd., San Diego, CA 92126, $49.95 16/32K tape or disk)

—Gerry Schechter

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The Dugger C Language Compiler, Version 1.2

By Richard A. White
Rainbow Contributing Editor

The only C language compiler available for the CoCo Disk Operating System as opposed to *Flex* or *OS-9* is Dugger's *Small C*, Version 1.2. This is a machine language program that will run in 16K. I have not tested whether it will operate with the new CoCo ROMs and CoCo 2, and 64K CoCo owners would be well advised to consult Dugger's before purchase.

It is by no means a complete C, but it is a sufficient implementation that one can learn how to program in C with it. You can also do some fairly significant programming even with a small compiler like this. For example, I used Dugger's C to write a program for *the Rainbow* that examines a BASIC CoCo program and reports whether it should run in Color BASIC, Extended or Disk BASIC. It was basically a learning exercise, but the resulting machine language program well serves its intended use.

The compiler is provided on a single, non-copy-protected disk with a 40-page manual. On the disk are upper case and lower case versions of the compiler, library function files and a number of example programs, including one that lists an ASCII file to the screen. These files are listed on a note sheet that comes with the documentation. Not listed on the note sheet are ADDSEQ and STRIPIT which will strip sequence or line numbers from an ASCII file or add them back in. This means that you can use an editor that produces line numbered code and use STRIPIT to prepare an unnumbered text file for the C compiler. The compiler produces unnumbered assembly language that is to be run through an assembly program that is not provided. If you have an assembler that requires line numbered assembly language, use ADDSEQ to line number the file.

The Dugger C Compiler does not support the float type of variable. However, library functions are provided that access the BASIC ROM's floating point routines and use other ROM routines to print floating point values. This is not standard C practice, but at least is in the spirit of the language, in that functions are used to do anything not in the compiler itself. It is better that what is in the compiler conforms to standard C practice or not be there at all.

The compiler supports integer (two-byte), character, array and pointer variables. Long integer and float variables would be nice to have and are promised for Version 2—due around the end of the year. Most C operators are supported, though there seem to be a few variations in logic operator practice from standard C.

In the control statement area, IF . . . ELSE and WHILE are present with FOR scheduled for Version 2. At the end of the documentation is a listing of standard C elements and which version they are scheduled for. I have had a need for SWITCH . . . CASE which is not due until Version 3. Though you can completely control any program using IF . . . ELSE and WHILE, many published C routines use FOR which will be in Version 2. Reserved words, normally written in lower case, are asm, break, char, continue, define, else, endasm, if, int, return and write.

Reserved words "asm" and "endasm" are used to include

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assembly language sequences or assembler directives in the C text file. One important use of this to assembly language programmers would be to include refined and efficient assembly language routines in a C program or function. Compiled code is seldom as efficient as carefully-refined, hand-written code because some compromises for generality must be made in the compiler. I use asm and endasm to include the LIBS assembler directives which we mention later. Note that the compiler produces fully relocatable code and included assembly language should also be relocatable.

Following normal C practice, all I/O routines are in library functions. There are no graphics screen functions provided. As supplied, these functions allow output to screen or to disk. Input is from keyboard or disk. Not documented is the function prttog( ). A prttog(0) sends output to the printer rather than the screen, while prttog(1) turns the output to the printer off.

The printf( ) function is a simplified version of the standard C library function. This is appropriate since it only has to print integers, but will need to be revised for a compiler supporting float variables.

The manual is a fairly terse reference for the compiler. While some examples are given, there is no hope of learning C from this document. Standard C is that described in "The C Programming Language," Brian W. Kernighan and Dennis M. Ritchie, Prentice Hall, 1978. Since Dennis Ritchie wrote C in 1972 it is nice that people agree his writeup is important in setting the standard. But, after the first chapter, Kernighan and Ritchie get deep very fast, and yet another level of digestibility is needed. So, start with "The C Primer," Les Hancock and Morris Krieger, McGraw-Hill Book Company, 1983. This book is a jewel. It takes the reader step by step through the basics of C with enough explanation and wry humor to make the trip a fairly jolly one. If you get serious, get Kernigan and Ritchie as well. One word of warning. Both these books describe C as implemented on a PDP-11/45 minicomputer. So descriptions of the compiling process and files inclusion do not apply to the Color Computer or to most other micros, for that matter.

Now, a few words on the process. Write your C program in any text editor that supports the full CoCo set of keyboard characters. Some standard C characters are not supported by the Keyboard and alternates are used. *Telewriter 64* and Nelson's *Super Color Writer* can be used as can most basic text editors. Dugger is close to releasing a text editor that is being written in C. After the program is saved to disk, the compiler is loaded and compiling instructions issued. You may compile a number of files in sequence that will be saved as one assembly language file. The Library functions are included in this way if your assembler does not have a LIBS command.

In summary, Dugger's C is a good value for the price. You can learn a lot about C using it and can write significant and useful programs, even with its limited set of commands. I contrast this with a couple of BASIC compilers I have seen that were so limited they were nearly useless. The upcoming Version 2 will bring some important improvements, though even this will not be a complete C. Thus, transportability of C programs from other machines without some rewrite will not generally be possible. Your alternatives are to move to *Flex* or *OS-9* and pay over $100 for a C compiler. And, Bruce Dugger has advised that owners of Version 1.2 will be offered an upgrade to Version 2 when it becomes available.

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Disk Graphics
Multi-Faceted, High Quality

By Ed Lowe

I had thought to myself that, come the day when I finally get off the ground in this high-tech business, I'm going to need a graphics department to put out scads of beautiful multicolored charts for information-hungry clients. A scan of computer magazines for available high quality graph generators and printers, however, left me in the "one of these days" mode. That is, until recently. With the advent of Radio Shack's new *Disk Graphics* package, I can now envision a neat little room under the glow of a flickering TV screen (or even a monitor) hooked up to a minimum 16K CoCo and disk drive or two, driving a CGP-115 Color Graphics Printer, a graphics capable dot-matrix printer (for fast "proofs"), and a whiz-kid to run it all just for the experience. Think of the return for the investment! Line up, customers!

When I saw this package, I also opined that Radio Shack sent out a very important signal by marketing *Disk Graphics*: they now intend to fully support the Color Computer with top rate applications programs with this, as the first of hopefully more that have uses even outside of the hobbyist's den. Could it mean that, at long last, "they" too are recognizing CoCo's power and potential?

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In any event, this review of a major Big Daddy product was seen as a plum, a bouquet from *Rainbow*. I think you'll be pleasantly surprised at the power, speed and high quality product of *Disk Graphics*.

Let's first put "graphics" into context. Radio Shack's new *Disk Graphics* 1.4 (variously spelled with and without the final "s") is an outgrowth of its cartridge package recently announced in the RSC-9 catalog. "Graphics" here has nothing to do with drawing space invaders or frogs on the high-resolution screen. What we'll be dealing with are pie, bar, line, point, and key charts, their generation, display, storage, and so forth.

Disk Graphics will let you plot a variety of charts and display them on the Color Computer screen or print them on a graphics or graphics-capable dot-matrix printer. The folks in Texas even venture to say: "With its multi-faceted chart-plotting capabilites, *Disk Graphics* has many practical, business, scientific, and engineering applications. And, with its easy-to-follow menus and prompts, *Disk Graphics* lets you draw very sophisticated charts . . . quickly and with a minimum of effort!"

Even though I know that both you and I have heard those words before (to someone else's music), this time I think we have a true hit on our hands. I've been working with this package licensed to Tandy by Robert G. Kilgus for some three weeks now and, though I still don't know for sure what I'm doing in all cases, I'm convinced it's not their fault. Fact: I'm not the world's brightest and I haven't spent every waking moment on it, but I'm no dunderhead either. So, even I can generate beautiful charts using their examples and samples and a few of my own devising.

There are a few things about *Disk Graphics* I just can't seem to get down pat. I'll discuss those as we go along but, frankly, what has led to this lack of self-confidence while using *Disk Graphics* results from the layout of its documentation. I had expected an absolutely perfect example of documentation, but I discovered that even "they" may have some problems perceiving just what the user may need to guide him. I'm not talking about the computer addict; I'm talking about the kind of person who buys an applications program to get a job done. The kind of person who isn't all that interested in the technical "hows," but rather in plugging the program in and getting results without having to burn a barrel of midnight oil. In some respects, I think that person will be a bit let down. But let's take a look at the documentation and then discuss some of the practical hows.

Disk Graphics' documentation comes handsomely packaged like its big brothers. That is to say that it is encased in a very nice, colorful three-ring binder. On opening the binder, the first two items you run across are an applications and system version log for your maintenance, and your software registration card (postage paid). Next comes a pocketed plastic insert, which holds the system disk. It could also hold your backup, assorted pens and pencils and notes. A four-page quick reference chart of standard sized very heavy stock paper containing most of the system values is loosely inserted.

The meat of the documentation is 86 typeset pages on heavy paper, complete with figures and sample charts all prefaced by a contents page. This contents page quickly points you to a general subject or chapter heading only (12 chapters and five appendices). This is not an index. In fact, there is no index or way to quickly locate specifics. And here, to my mind, is where the (my) trouble starts. Each chapter presumably covers a complete subject or type of chart. One would expect an index of sorts to a manual as

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large and complex as this. It suffers without one. I don't agree with their assumption that, for example, if you only want to plot and display, you can skip all else and go directly to the specific chart type chapter. But then, maybe we have different ideas about what the user needs.

My usual plan of attack with a new program (for review) is to set the program tape or disk aside and sit down in my favorite easychair with a fresh cup of coffee and the documentation and go from cover to cover. I did that with *Disk Graphics*. The second time through, I decided to go ahead and give the system a try. I think it was because I was being overwhelmed with information. The overview of *Disk Graphics'* operation was enough to send me on break.

The System Programs

A look at the directory revealed the following files and status:

Filename/Ext	Type	Format	Gran	St	End	Exec
BASDEF/BAS	BASIC	BINARY	1			
BASDEF/DEF	DATA	ASCII	3			
DOLLAR/DEF	DATA	ASCII	1			
BOS/BAS	BASIC	BINARY	2			
DOS/BIN	ML	BINARY	3	$EA4	$20EB	$10A2
GRAPHIC/BIN	ML	BINARY	8	$2ABF	$6C97	$0000
PROFIT/DEF	DATA	ASCII	1			

Initially, you'll only be concerned with DOS/BAS, DOS/BIN and GRAPHIC/BIN. The others are demonstrations files. You probably won't be concerned with them at all because you're not even really told about them. They're just there!

DOS/BAS and DOS/BIN are obvious. Right? Docsn't it stand to reason that DOS/BAS handles disk I/O operations since CoCo disk I/O can't be accessed by machine language programs? Sure it does. But listen to what the Shack/Tandy/Kilgus people nonchalantly list as a system requirement aside from the hardware already mentioned: "Color TRSDOS 1.7 or later." Did I miss that when it came out? My "Color TRSDOS" is version 1.0. What happened?

Apparently Color TRSDOS 1.7 was written especially for this package, but don't quote me on that. We are told that when any program is run under the control of this Color TRSDOS, about 4K of RAM is required for Color TRSDOS, the text display, and other system overhead. We're also told that *Disk Graphics* itself contains over 16K of machine language instructions. (See the directory information above.) That's a big byte out of RAM! Not to fear, though. *Disk Graphics* gets around the RAM problem, even for 16K users, by only loading in what's needed at the time.

I took Color TRSDOS for granted since there was no further mention made of it after the introduction. I did bump into it later, however, when I opted to exit the graphics program. Again, more about that later.

A word of caution: You are not given an extra "working" copy of the system disk, nor are you told or advised to make a backup copy. I naturally made one to use for the review. A day later I was happy I had done so when I experienced my first truly disastrous disk crash! Since you must keep the system diskette in drive 0 at all times, don't jeopardize the one you've bought. Keep it safely tucked away someplace out of radiation range! Use only your backup. By the way, I don't know if the number of backups is controlled or limited by software—a nice scheme used by Tandy in many of its high priced packages—because I saw no need to chance testing that.

Getting Started

After making a backup copy, I was ready to fire up the system and do some magic. After inserting the system disk, I carefully typed in RUN "DOS," the drive churned, and DOS/BAS started loading in the machine language programs. A few seconds later, after some strange sounding drive churning, the screen lit up to display the main menu beneath the version, copyright and licensing information. (I'm using a black and white monitor these days since my color went on the blink, but the normal display is yellow and red.) The main menu:

1) CLEAR FEATURES
2) CREATE A CHART
3) LOAD INFORMATION
4) SAVE INFORMATION
5) EDIT FEATURES
6) DISPLAY RESULTS
7) EXIT PROGRAM
PRESS CHOICE NUMBER
(BREAK OR ENTER FOR MAIN MENU)

Chart Features and Definitions

When generating a chart, *Disk Graphics* creates three files called DEFWORK1/WRK, DEFWORK2/WRK, and FEAWORK/WRK. Your keystrokes, or chart definitions, are saved in one of the DEFWORK files. Should you have to make revisions, the values in the first file are read back and the new version is saved in the second DEFWORK file. The next time around it flipflops the other way. Then everything is stored in the FEAWORK/WRK file. This information is stored differently when using the save information option. Under Color TRSDOS 1.7 you can presumably save as many as 53 charts on a single diskette.

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A constant distinction is made between "features" and "definitions," but I've yet to fully appreciate that distinction.

Graphing

The documentation contains ample definitions of each type of chart and suggested uses. Selecting the "Create a Graph" option (2) from the main menu runs you through a very fast confidence check which checks for previous charts and whether any features should be cleared out or not. Then you're asked what type of chart you wish to create: pie, bar, line, key, or point. Again, after a single keystroke and some drive churning, you're in the data prompt mode. I like this mode, because that's where the action is. To enter data, you simply use the arrow keys to move the blinking cursor to the bracketed input fields, type in the data and move on. When you've completed a specific segment, you simply press [ENTER] and the data is automatically stored. you can escape to the main menu at any time simply by hitting the [BREAK] key.

Generating a chart using the samples provided is a breeze. At least one sample is given for practicing each type of chart. The only one I didn't try is the point chart, mostly because I am underwhelmed by the significance of a point chart. But then I had my work cut out for me in other areas trying to keep myself mentally attuned to the subject at hand.

In defining a chart under *Disk Graphics,* you're basically concerned with the following information:

Chart title
Overall height
Overall width
Chart position
Shading
Color
Erasure
Periods
Items per period
Scale

To repeat: I followed the instructions and had the sample charts on the screen with a minimum of trouble. But sometimes I felt a monkey could have done the same. Did I really know exactly what I was doing? No. The examples sometimes infer that you must just take things on faith. This is not a serious deficiency, however. It means that you've got to do some page flipping to refresh your memory.

Displaying/Printing Graphs

Just to view a graph on the screen won't hack it. Especially since *Disk Graphics* employs what is called a "Superscreen" which allows you to draw really big charts in terms of both width and height. This "Superscreen" has 999 addressable points horizontally and 999 addressable points vertically. These "Superscreen" points are not to be confused with CoCo's screen pixels. Draw a chart at the maximum limits of "Superscreen" and you will only see a small, small portion of it on the screen at any one time. You can scale this big one down in increments of ½ the previous size to (to ⅛th) and move the scaled version around in relative position, but you need a printout.

To use *Disk Graphics,* you must have: A minimum 16K CoCo with Extended Color BASIC; a color TV (only aesthetic penalties for using a B/W); disk drive and controller; and a COLOR TRSDOS 1.7 or later (?). Optional equipment includes: Cassette recorder for loading charts created with the ROM version (26-3157, $39.95) and a printer with a graphics capable dot-matrix, or the CGP-115 Color Graphics Printer (26-1192).

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I decided to go for the four-color reproductions right away. I could always unhook the Okidata (no graphics capability yet), uncover the LP VII and hook it up for black-and-white prints. (I knew there was a reason I still had it!) I wanted as much of the complete equipment setup as possible. So, I made an arrangement with one of the friendlier Radio Shack store managers in the area to let me "borrow" a CGP-115 to do a review of one of "his" company's major new pieces of software.

To get a display or printout, you merely make a one-keystroke selection from the following menu:

```
DISPLAY METHOD?
1) 96 x 128  4 COLOR
2) 192 x 256  2 COLOR
3) 999 x 480  B/W PRINTER
4) B/W PRINTER (RIGHT HALF)
5) 480 x 999  4 COLOR PRINTER
6) COLOR PRINTER (UPPER ½)
PRESS CHOICE NUMBER
(BREAK OR ENTER FOR MAIN MENU)
```

Selecting 5 started the CGP-115 on its magical journey across the 4½"-wide roll paper. I'm still amazed by that little machine. Its output is amazingly clear and crisp and it's no slouch on speed, either. The size of a normal chart, using system height/width defaults (192, 256) to match the screen, is 1½" high by 2" wide. The largest size I tried was 600 points by 600 points. The color printer atually handles such large sizes in two segments. It even punched out perforations, along which I could scissor to tape the two segments together.

A significant deficiency I found in the manual was in relation to the "Superscreen's" height and width. While the feature is discussed at some length, there is no matrix chart which shows you where a location of, say, height 140 and location 211 will fall on the screen. I suppose by Christmas I could probably have one drawn up to give me an idea of where things fall in relation to 0,0 in the lower lefthand corner, but . . . until then, I'll just have to imagine point parameters in my head. That's asking a lot of someone like me!

Anyway, that vertical bar chart came out at a little over 4¾" by 4¾" on the CGP-115. The LP VII printed the same chart out at 10" by 10" with extremely good definition even for it. (It also took 13 minutes to do the job; the CGP took a little under six minutes.)

Users with a 32K machine will discover a very nice built-in feature in *Disk Graphics'* print spooler. You won't have to sit on your hands during printouts. Unused portions of RAM are used to spool data to the printer and you can go about your business creating other graphs or whatever. While in this mode, you can check on the print status at any time to see exactly how many more bytes have to be sent and then return to what you were doing. If you wish, you may even abort printing with absolutely no ill effects.

Saving and Loading Information

As you can see from the menu below, this presents no real problem:

```
SAVE/LOAD FILE NAME   [CHARTDEF]
WHICH DATA?     [1]
  [0=FEATURES, 1=DEFINITION]
```


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```
DEVICE      [0]
  [0=DISK, 1=TAPE]
DISK DRIVE      [0]
MEMORY CONTAINS:
XXXXX FEATURES
XXXXX DEFINITION
XXXXX FREE GRANULES (DRIVE 0)
```

If you don't specify a filename, the system defaults to CHARTDEF. Values in brackets are system default. Use the arrow key(s) to position the cursor over the value if you want to change it. For example, you may save to or load from either disk or tape simply by placing the cursor over the zero and changing it to "1" for tape or hitting [ENTER] for the default value.

A Problem?

I had some problems understanding precisely how to redefine all of the features to change size, position and so forth to get different printouts, both screen and printer, of the same basic data. In the course of experimenting, I locked up the system and ultimately totally wiped out my backup disk! *Disk Graphics* has its own error messages. The first one I got indicated that I (?) had failed to close a file. Unfortunately, I had no way of knowing how to recover from this condition. I later "rediscovered" an obscure and oblique remark way in the back of the manual under the section on saving and loading a features file which says "Important Note: If the system 'hangs up' for any reason, press the [RESET] button on the back of the Color Computer. When the message 'FILE NOT CLOSED AFTER CHANGES' appears on the screen, press [ENTER] to return to the *Disk Graphics* program." Too late! Because I am cautious of hitting the [RESET] button with a program disk in the drive, I had done something else, including taking the disk out and doing a cold start. The system started giving me I/O ERROR messages then, so I knew I was in deep trouble. The manual was no help and that's when I really started to bemoan the absence of an index with an entry such as "In Case of Trouble" or even "In Case of a Delta Alpha Attack" do such and such.

I shut the manual, concerned now only about my system. Repetitive I/O ERROR messages. In an attempt to reformat the crashed disk, I found that I was totally unable to do so and therefore out of business. So, in classic southern fashion, I shut the whole system down for almost two days and went cold turkey. When I got back to turning it on again, I had no problem formatting a fresh diskette and backing up the program. Explain that one, please.

The same thing occurred once again days later, but the second time around I kept hitting the [RESET] button and [ENTER] like the man said, finally recovering as if nothing had happened. I still don't know what I did wrong in either case! (I did notice during the first crash that one of the DEFWORK files had jumped from the normal 1-2 grans to 29 in a matter of minutes.)

Color TRSDOS 1.7

As far as I can determine, Color TRSDOS 1.7 is only for this package and is not otherwise very useful. The fact that the system diskette must be in drive 0 at all times limited investigation under my one-drive system.

Color TRSDOS 1.7 (11/82) is visually accessed by selecting Option 7 (Exit Program) from *Disk Graphics'* main menu. In addition to the copyright and licensing notices, the following are displayed on the screen:

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2. EXEC A PROGRAM
3. START CLOCK DISPLAY
4. DISK ALLOCATION MAP
5. COPY FILES
6. DIRECTORY

Exit to BASIC: This option permits you to properly exit and reconfigures all RAM pointers (back to 22823 bytes of memory for a 32K disk-based machine). To get back into *Disk Graphics*, you must again enter RUN "DOS."

EXEC a Program: Not selectively found. Only executes *Disk Graphics* on the resident diskette, although it may be possible to execute another program *SAVEd* on the system diskette.

Starting the Clock Display results in an HH MM SS reversed video clock in the upper-righthand corner of the screen. I could find no way to set this clock, so what you have is an elapsed time clock only. (This clock and many of this section's features will look familiar to some of you.)

The disk allocation map (Option 4) will read two drives and indicate which sectors have data written to them. Again, since the system disk must be in Drive 0 at all times, I could only read data on it. Attempting to read another, totally unrelated diskette resulted in "SYSTEM FAILURE SYSTEM FAILURE" across half the screen and a complete system lockup. The only recovery was to *RESET* and start all over.

Files copying: Again, I was restricted to the system diskette. Although there are the usual options concerning source and destination filename/extension and drive(s), I could find no use for this. The program asks the question "If drives are the same, are you using different diskettes (Y or N)," which leads me to believe that you can bypass the "N" default and possibly copy a *Disk Graphics* or maybe even unrelated file to another diskette.

Directory: Reads the directory of the resident diskette. Good for finding out what features and definitions files are stored.

One more thing about these features: once you select one, you must follow through with it and do some. There's no change of mind escape.

I'm surprised that there is not one word on running and using these six Color TRSDOS 1.7 options. Without inclusion in the documentation, they have only limited application and at first glance appeared to be only bonus additions.

Summary

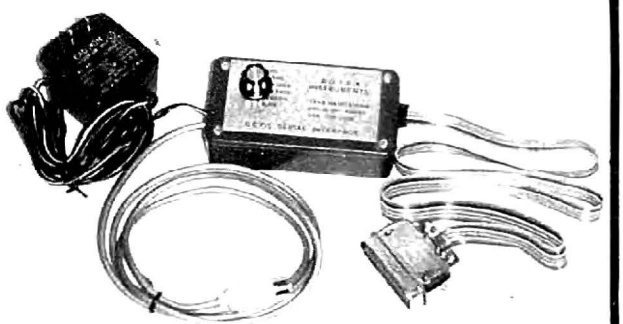
Radio Shack's new *Disk Graphics* package, even more so than the original ROM version, may be viewed as a major piece of quality software with definite applications in the business world. While it may not rival some of the kilobucks systems, it offers a viable alternative. Its product is crisp, clean and of extremely good quality. The fact that you may vary the output's size beyond the normally diminutive printout, especially in four colors on the Color Graphics Printer, is a real boon. Because of its outstanding features I am more than inclined to overlook what I consider some of the documentation's shortcomings and would have no qualms at all about recommending the complete hardware/software package to anyone in need of a good, down-to-earth yet inexpensive in-house graphics capability, especially if they were going to use it in a small business environment.

(Radio Shack, Catalog No. 26-3251, $49.95)

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No Matter How You Say It, *Colorspeak* Is The Last Word

In the not too distant future, programs for the Color Computer will feature clearly intelligible voice-overs on a regular basis, thanks to *Colorspeak,* a voice synthesizer created by Bumblebee Software of Chicago.

Yes, there already are some programs that feature audible commands. But in far too many cases, the effect is like the sound of doom, accompanied by a gusting effect that can blow you out of your chair.

Not so with *Colorspeak,* which comes complete with a demonstration program, instructions that seasoned programmers can immediately use, a lengthy phonetic speech directory and the heart of the program—a Votrax SC01 Phoneme Synthesizer.

The potential of *Colorspeak* is clear in the demonstration program, which includes a spelling test, a math quiz, a sampling of words, graphics accompanied by voice-over, and the opportunity for you to experiment with your own vocabulary. It is easy to imagine the synthesizer being used as a homework aid, for automatic phone answering, a talking dictionary, a tour guide in a talking adventure game, an aid to the handicapped, and in the delivery of personal messages.

Of course, anyone who has been in major airports lately or used one of those talking copying machines knows that voice synthesizers have been in for a while. The good news for CoCo lovers is that ours has arrived.

Colorspeak has its program stored in a 4K-byte ROM, so it's there when you turn on your computer. The creators claim that it is the only stand-alone voice synthesizer cartridge for any personal computer.

The Votrax can produce 64 different phonemes (the basic sounds of speech) and four inflection levels, resulting in 256 sounds in which to produce words. (For the mechanical-minded, a technical data sheet is included in the appendix to the instructions.)

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The most difficult part of using a phoneme synthesizer, the authors explain, is to determine which phonemes to string together to produce a word. A list includes all the phonemes that the program is capable of using. The process of selecting the correct ones may involve sounding out the word, identifying the number and types of sounds contained. The correct phenomes for teacher, for example, will be: T,E1,T,CH,ER. For the word station, they would be: S,T,A1,AY,SH,UH3,N.

If phenomes are not your thing, and I'll have to admit that I'm among that group, then you can experiment with the text-to-speech mode, trying something like tee-chur or stae-chun to get the correct sound.

There's also a spelling mode, which I found to be a lot of fun in demonstrating to onlookers how clearly CoCo could pronounce the letters of the alphabet.

The following listing is included in the instructions to get you started writing your own programs:

```
10  REM DEFINE SPEECH STARTING ADDRESS
20  DEF USR0=49152
30  TALK$="/T BASKETBALL."
40  REM SPEAK THE STRING
50  A=USR0(0)
60  GOTO 30
```

Line 30 connotes which mode you are in and TALK$ string precedes whatever is to be spoken. If you're a veteran at programming, you should have no problems in expanding upon this example. If, on the other hand, you're new to the game, you'll probably be frustrated by all the "EDIT 30s" you'll need to utilize before getting comfortable with the procedure.

The folks without Extended BASIC, relax. The program also includes a similar routine for you. They've thought of everything.

Colorspeak was originally conceived for 16K machines at a time when the majority of users were limited to that capability. The early versions did not work on computers with more storage space. Recognizing the speed with which 32K and 64K upgrades were gaining in popularity, the creators went back to the drawing boards—and one version now fits all, with some modifications: For 16K machines, the user needs a 1 Clear 1000,15700. For 32K and above, the command is 1 Clear 1000,32000.

Colorspeak is in no way a program for the beginner or for those who are merely seeking a new game for their collection. Oh, you could have fun using the demo program, but without the skills to use it at its fullest potential you would soon tire of it or become frustrated.

For the serious programmer and the professionals in the wide-open CoCo market, *Colorspeak* will soon be indispensable because the game fanatics and those who use the computer for educational purposes are going to expect good voice-over programs. And until someone can concoct a chip that plugs right into the computer board like the SAM chip on the 64K upgrades, *Colorspeak* is, indeed, the state of the art.

(Bumblebee Software, P.O. Box 25427, Chicago, IL 60625, synthesizer with demonstration cassette tape, $169; user manual, $4)

—Charles Springer

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Articulator Could Be Good But Needs Documentation

In a recent issue of *the Rainbow*, I received a game which began with a spoken greeting, and I asked, "How did they do that?"

I still don't know how they did it, but one way that such an effect can be accomplished is to use *Articulator*. That's a 16K machine language program that will "read" sound from a tape, or sound spoken into the tape recorder's microphone, and convert the sound into digital data that can be stored in the computer's memory, played back through the TV speaker, and stored on tape in digital form for use in your own programs.

The program is written in a relocatable form. You can load it higher in memory to make room for a long BASIC program, or lower to make room for a longer soundtrack. According to the instruction sheet, the machine code takes up 800 bytes, and any RAM above that is available for soundtrack storage.

As the documentation explains, the capacity of the soundtrack storage will depend mainly on what kind of sound you are recording. Low frequencies such as male voices will take up less space than higher ones, and some phonemes such as "ss" and "ch" will use up more memory.

First, the program is used alone to read in and digitize your soundtrack. Commands, explained in the instructions and summarized in the on-screen menu, are fairly simple to understand and use. M and A are used to toggle the motor and audio on and off. The letter "M" flashes on the screen if you are turning the motor on. There is no such indicator for the audio. R "reads" the audio, and digitizes and stores it. S makes the stored soundtrack that was saved by T.

There are also commands that are supposed to shorten and lengthen the soundtrack. I had no problem in shortening the soundtrack, but lengthening sometimes caused the computer to hang up when I then tried to make it speak.

Obviously, the program by itself is of limited value. You have to be able to use it with your own program. Unfortunately, this is where the writer of the instructions didn't do a good job.

Seven entry points (in addition to the start point) are listed. Some of them are clear. If you *EXEC* or *DEFUSR* three bytes above the start point, the soundtrack will start speaking. This is the same as pressing S from the menu. Similarly, there are entry points that substitute for the I and R commands.

The remaining entry points listed are; "set track start," "set track end," "get track start," and "get track end." I was unable to figure out how these options work, and the instructions were no help.

Neither the instruction sheet nor the cassette label has an address or a phone number to ask for help.

If you try to read in a voice recording made of a CTR-80A, you may be disappointed with the results. It takes a hi-fi quality sound recording to produce a decent soundtrack.

On the whole, the good folks over at 29 Enterprises have come up with a pretty good idea. If they'll just take some time to iron out the bugs, and write some documentation that is worthy of their programming effort, I can see *Articulator* becoming very popular.

(29 Enterprises, 1208 Country Ct., Cary, NC 27511, tape $20)

—Neil Edward Parks

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Wizard's Magic For Children, Not Adults

I must admit that I was really looking forward to *Wizard 64* being a great adventure game. After all, the flyer with the disk says, "An original multi-player adventure for the 64K Color Computer." The only other thing the flyer mentions is how to load the game from disk or cassette and have fun. But still, this is the first adventure I have seen made for the 64K CoCo (16K and 32K versions are also available).

The introduction is interesting. You have to go across a lake and forest, reach the mountains and get into the tomb. Find the treasure and escape. In order to help you survive the journey, you have three choices out of the following six items: a suit of armor with sword and shield, a charm of protection, a chain mace for strong ones, a week's food and water, a spell to repel attackers, and a small sack of gold. After choosing your means of defense, you are shown a point chart with your "Life," "Ability," and inventory. The adventure does have the ability to accept up to four players' names with one person being the leader.

Before you start the adventure you are shown a graphic map of an "inn," lake (in blue), forest (in green), and mountains (inverted Vs in high-resolution). You may return to this map throughout the game. However, regardless of where you are, the map is always the same, even if you are in the tomb.

The introduction, showing that you can move north, south, east, west, (m)ap, or (p)oints, is the best part of the adventure. Once I got into the game itself I felt myself "Slideing," as it is spelled in the game, into a novice's fantasy. Attacks by a "Greel," "Warog," "Suit of Armor," "Zombie," and the like, are met too numerously. Each encounter asks you to either fight or cast a spell. If you fight, two graphic characters jump around the screen for a varied length of time and, for no particular reason, you either win or lose. If you cast a spell, graphic circles rise, accompanied by music. Upon conclusion, you are either told your spell worked or did not work. The means of notification is, "Yipee!!! The Warog Has Been Burnt To Ashes!!!" Sorry, but "Yippee" and "Hurrah" do not impress me.

Finally making it to the Wizard's tomb, you meet a little man whom you must attack in order to gain entrance. He speaks to you, but nothing he says is in quotes. If you defeat him you get, "Hurrah!!! The little man has been burnt to ashes!!!" And you gain entrance to the tomb.

Traveling through the tomb, you find different rooms and passage ways that have various objects in them but you may only travel north, south, east or west. You cannot examine or look at anything. When you get into the depths of the tomb, after being attacked by things, and either fighting or casting spells, you come to the treasure and then make your way out of the tomb. The tomb has rooms that have, "Green slime oozing down the walls . . . this is a creepy place!!!"

O.K. Time for me to turn this over to my kids. Faster than an "open sesame," my children got to work on the Wizard.

They actually liked it! They did not mind the numerous attacks or the Yippee's. It was right on their magic carpet ride. It took them about 15 minutes to complete the whole adventure.

So how does *Wizard 64* come across? If the instruction flyer said, "For children — Ages 9 to 13," I would recommend it over my objections to spelling and grammatical errors (although there is no excuse for them). But as an adult looking for something magical in an original adventure for the 64K CoCo, I feel the Wizard has run out of spells.

(Skyline Software, Soft City, 442 Sunnyside, Wheaton, IL 60187, $21.95 tape, $23.95 disk)

—Michael F. Garozzo

Hint . . .

Undocumented

I have discovered a few *EDIT* subcommands that are not documented in the Extended BASIC manual. I found these when going through a model 1 quick reference card and decided to try them. They are as follows:

A: Cancel all changes, list line, continue editing.
Q: Cancel all changes, stop editing.
E: Keep changes and stop editing. (same as ENTER)

I have never seen these subcommands published in any reference to the CoCo, although I can't believe that no one else has discovered them. The A and Q can be very useful if you make a goof and don't want to try and piece together a line or retype it.

—Craig M. Arnold
Dallas, TX

Editor's Note: This hint was published in the August 1981 edition of the Rainbow (Vol. 1, No. 2) but it's time we shared this with the many readers who've joined us since that mighty nine-page issue.



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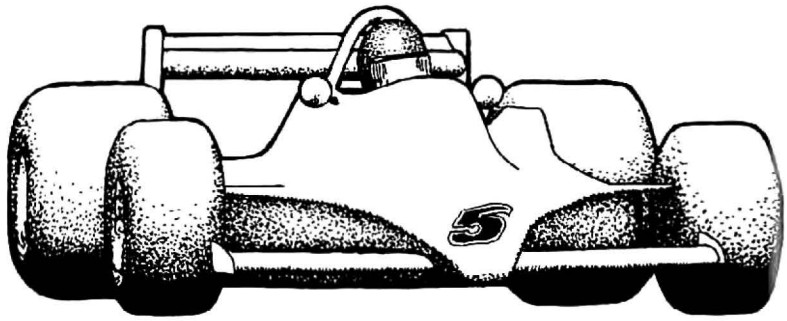
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Like a real race driver in practice and qualifying sessions, you compete against the clock and against the existing lap record for that track. *Revolution* records the lap records and the name of the person who set the record, so you always know who reigns supreme on your favorite track!

DESIGNED WITH YOU IN MIND

Revolution is menu-driven, and self explanatory. Information screens tell you what you need to know. When you're ready to play, a menu of the names of all your tracks is displayed, along with the lap record for each track and the name of the person who set that lap record. You select a track with a single keystroke, and *Revolution* takes you there.

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Revolution is a unique game, because it allows you to create the most important part of any race game: the track itself.

The first time you run *Revolution,* you will be able to choose from several tracks and cars which are included with the game.

But, with *Revolution,* this is only the beginning! You can create as many tracks as you like. You can make each new track as difficult or as easy as you wish. You can make easy ones to begin with, and tougher ones as you become more skilled. You may find creating tracks to be almost as much fun as driving on them!

You can save your favorite tracks to run on again whenever you wish. *Revolution* will automatically add these new tracks to the menu. And you can exchange your favorite tracks with other *Revolution* owners.

Be careful, though, about letting your friends play this game. They may not want to let you have your computer back!

THE EARLY *REVOLUTION*

A prototype version of *Revolution* was published in the September, 1982 issue of Rainbow magazine, under the name *The Track*. The response to *The Track* has been terrific.

Revolution has all the features that have made *The Track* a favorite, and *Revolution*'s fast, high-resolution machine language graphics are dramatically improved over the prototype's.

REVOLUTION NOW!

The original *Revolution* for the TRS-80™ Color Computer requires 32K and one disk drive. A new cassette version has action just like the disk version, and similar track-saving features excluding a menu of available tracks. The cassette version will run on a 32K Color Computer or TDP-100. You can upgrade to the disk version later, too, for a nominal fee.

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Jude is Genesis of a Good Idea

It may have been more appropriate to begin a series of computer Bible studies with Genesis but it would be no more welcome than *Jude*. Whether *Jude* is the first or next to last computer program on scripture makes little difference. It is here and it is useful.

The program is available on either tape or disk. Except for the standard loading difference, there is no operational change between the tape and disk. I operated both on my 32K CoCo with equal results.

Jude is actually a mini study Bible with all the notes and references available at the touch of a key.

As an assistant pastor of a small church, I have long since known that CoCo was a way we could use the power of the computer in the Lord's work. It is an inexpensive machine with many possibilities for the small church organization or business.

I have already suggested a computer financial report to the pastor and elders—now comes the program *Jude*, and potential for Sunday School and Bible Studies. We have a word for it. Hallelujah!

The program loads well from tape, but pay strict attention to the instructions and only load from a cold start. The program, in both tape and disk versions, will give you an error message and will not run if you fail to observe this precaution.

PRINT MEM on my F revision machine produces 630 bytes as the answer. So every nook and cranny is used for the program and floating "garbage" will mess it up.

Jude is menu driven and the menu is great, but the documentation is slightly lacking. I just sort of blundered into how *Jude* really works.

As you load the program, a billboard appears during the process. After the load is complete, the menu appears and gives you the option of looking at the index.

You can page through the index and get an idea of the abbreviations used and the sources quoted.

After a tour through the directory, you are told to press [ENTER] which launches you through a verse-by-verse presentation of *Jude*. If you press (C) during the presentation you get a commentary. If you press (R) you get references and scriptures to compare. This is where the documentation is not quite as clear as it could be.

The first time through I was stumped when one commentary had three parts and only two showed up. The next time I pressed (C) a second time and the missing comment appeared. I further found that pressing (R) more than once produced not only a list of referenes, but shows the verses themselves. When you have exhausted the references or commentary, an inverse END tells you to go ahead.

Aside from a couple of spelling errors and a few missing apostrophes, *Jude* is an excellent program for Bible Study. As in all such studies there may be a diverse option on some doctrinal matters, but this is true of the Printed Study Bibles and commentaries too.

Quality Christian Software has the Genesis of a good idea here. The program does everything it says it will. It is surely more than just a game, and it is surely the beginning of a set of tools valuable to any student of the Bible.

(Quality Christian Software, P.O. Box 1899, Duncan, OK 73533, tape $13.99, disk $16.99)

—Howard L. Ball



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Submitting Material To the Rainbow

Contributions to *the RAINBOW* are welcome from everyone. We like to run a variety of programs which will be useful/helpful/fun for other CoCo owners.

Program submissions must be on tape or disk and it is best to make several saves, at least one of them in ASCII format. We're sorry, but we do not have time to key in programs. All programs should be supported by some editorial commentary, explaining how the program works. We're much more interested in how your submission works and runs than how you developed it. Programs should be learning experiences.

We do pay for submissions, based on a number of criteria. Those wishing remuneration should *so state* when making submissions.

For the benefit of those who wish more detailed information on making submissions, please send a SASE to: Submissions Editor, *the RAINBOW*, P.O. Box 209, Prospect, KY 40059. We will send you some more comprehensive guidelines.

Please do not submit programs or articles currently submitted to another publication.

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Good Connections With *Video Clear*

For many people, one of the major attractions of the Color Computer is the fact that it uses a normal TV set instead of an (expensive) video monitor. The fact remains, though, that a home TV is better suited to watching Jay North, James Garner and J.J. Jackson than to playing *Jungle Trek*. Even so, when you first got the CoCo home and hooked it up to the big TV in the living room, that "COLOR BASIC OK" looked really good — but then CoCo grew like Topsy, with modems, printers, disk drives and what not, and now tear your hair out when you see all that garbage on the screen. At this point, you can either modify the CoCo for direct video output and get a monitor, or you can do something to clean up the picture on your regular TV set. This alternative is especially attractive if you have a really good TV set that you bought for normal viewing but would like to use with the computer as well.

The *Video Clear* interference rejection cable is intended to be a better way to connect the CoCo (or one of many other home computers, such as the VIC-20, Commodore 64, Timex/Sinclair 1000, Atari 1200XL, etc.) to a TV set. It is basically a ten-foot cable, with phono plugs on each end, which has a filter placed about four inches from the computer end. The kit also includes an adapter to match a phono plug to a 75-ohm (F-type) cable input, and another to match an F-type plug to a 300-ohm twinlead input (this is the type used for cable TV and master antenna systems).

The filter, which is in a red capsule about 1 x 1½ inches, is nothing more than a ferrite toroid core, about 1 inch in diameter, which has the cable wrapped around it eight times. This is not a new trick (as users of some other systems will attest), but it is very useful as it blocks RF garbage that may be on the ground bus of the computer from traveling up the shield of the cable to the TV set. The two adapters are intended to be used in place of the switchbox that comes with the computer; this usually provides a better connection to the TV's antenna input. (The phono plug-to-F jack adapter is itself a useful item; I've used one for some time.)

Most TV sets have the normal pair of screws for a 300-ohm twinlead line; many newer color sets also have a 75-ohm cable input as well. (A few sets — mainly GE and some Japanese brands — have only the 75-ohm input; these are supplied with an adapter for a 300-ohm line. This is also true of every video cassette recorder that I know of.) If you have an F connector on your set, you usually change the switch or jumper on the back of the set to the 75-ohm position, and then screw the phono jack adapter on the F connector. Some TV sets already have a phono jack connector. On these simply plug the cable directly into the set. (A CABLE/-NORMAL switch, if you have one, will not be the switch to change inputs.) If you only have the 300-ohm input, attach the transformer to the terminals and screw the phono-jack adapter onto the transformer. Now you can connect the cable between the computer and the TV; the filter goes near the computer.

I tried the cable on three different brands of computers. While the kit does filter out RFI coming up the cable into the TV and does make a better connection to the set's antenna terminals, no device of this kind can eliminate interference picked up by wiring inside the TV. Many sets have as much as a foot of twinlead between the turner (just behind the channel select knob on the front panel) and the screws on the back cover; this picks up a lot of interference. Newer sets with 75-ohm antenna inputs have a shielded cable between the turner and the input jack — this keeps the noise level way down. One thing to check is that all connections are tight; you may have to squeeze the outer prongs of the phono plugs slightly to get a good fit.

About the only thing wrong with the *Video Clear* is that it doesn't have a switch to select the computer or an antenna. The only way to use both is to change cables manually (which gets rough if your antenna uses 300-ohm twinlead and you have to use a screwdriver each time). You may find that the cable itself clears up the RFI without having to replace the switchbox; or you could use one of the many switchers that are now available for home video systems. You should *never* leave the computer and an antenna connected together without some kind of switch. The signal coming out of the computer can cause all kinds of problems around the neighborhood, and even interfere with navigational devices on aircraft. (For the same reason, feeding the CoCo's signal into an antenna directly is an absolute no-no — unless you like having the FCC kick down your door.)

As I said, the *Video Clear* cable is a very simple and effective way to cut down on RFI. If you have the stuff on hand, you could do the same thing yourself, but if you don't, the *Video Clear* is definitely something to consider, especially if your TV has a 75-ohm input.

(Computer Associates, P.O. Box 283, West Fargo, ND 58078, $14.95)

—Ed Ellers

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```
10 PRINT"EXAMPLE": FORX=ATO M:FORY=STO
P:Z=X + Y:PRINTZ:NEXTY:NEXTX
```

Into this: –

```
10 PRINT "EXAMPLE":
    FOR X = A TO M:
        FOR Y = S TO P:
            Z = X + Y:
            PRINT Z:
        NEXT Y:
    NEXT X
```

With one simple command.

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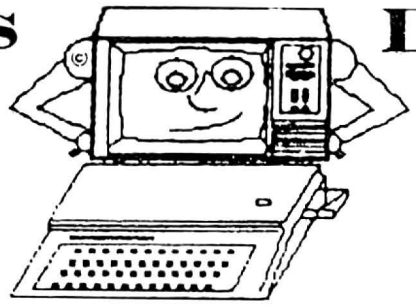
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would be the proper *CLEAR* used?
A: In developing the user's manual, a basic level of programming knowledge is assumed. Certain functions such as *CLEAR* ing area for machine language programs, relocating data to and from a cassette are not addressed in the manual. We felt that these functions are explained in good enough detail in many articles and such that appear in all four of today's magazines available for the Color Computer, as to exclude the need for explanation in the *Intbasic* 1.0 user's manual.

The proper *CLEAR* command to use in step 4 in order to run "PROGRAM 3" is the following: CLEAR 100,9990.
Q: How am I to produce a *CSAVEMable* program without saving the entire RAM? The sections are to be separated, but who's to know where one is to end and the other is to begin?
A: The final product, as produced by *Intbasic*, is in three parts. By running the program in succession, one may create a continuous program. Such a program may have the text table start after the end of the ML program, followed by the subroutines. This may only be accomplished by initial trial compilation, which is needed to first determine how big each of the parts are. If you haven't tried already, you *can* locate the variable table before the main program (and the same goes for all other parts).
Q: I have not been able to run the compiled program when, as prompted in running the compiler, I enter a different starting location for the subroutine library. What am I doing wrong?
A: The problem seems to be in relocating the subroutines to the location desired. Before running the compiled version, the subroutines must be relocated. The following BASIC program will help in relocating the subroutines:

```
1)PRINT"ENTER START OF AREA
TO BE RELOCATED"
2) INPUTS:PRINT"","ENDING AT
?":INPUTE
3) PRINT"","TO BE RELOCATED
STARTING AT"
4) INPUTN:J=0:FOR I=S TO E
5) Z=PEEK(I):Y=N+J:POKEY,Z:J
=J+1:NEXT:END.
```

Q: Can I sell programs that are compiled using *Intbasic*, or do I need some kind of license to do so?
A: You may sell a compiled program, as produced by *Intbasic*, without a license from us, provided we are notified before sales are made.
Q: How much space can I save by compiling my program. What are the variable dimension limitations, if any?
A: *Intbasic* will produce a compiled program, whose size depends on the commands given. Commands like *GOTO* 10000 take 7 bytes of RAM under the interpreter, while the same compiled command will only take three bytes of memory. Variable storage is more efficiently used under *Intbasic*. The maximum allowable variable *DIM*ension for an array in the *Intbasic* is unlimited. Arrays like A(300,100) can fit a 64K machine.
Q: Is my disk system *completely* compatible with *Intbasic*?
A: *Intbasic* 1.0 was designed to run on a non-disk system. An initialization routine, called during execution of *Intbasic* 1.0 and also during execution of any program compiled by *Intbasic*, clears away certain RAM "hooks" created by Extended BASIC and Disk BASIC. This enables operation of the compiler under Color BASIC. On the other hand, one may disable this initialization routine and allow execution of disk commands from within the compiled program (by performing the desired *EXEC*s to the ROM routines is Disk BASIC). The command will disable the routine that initializes lower RAM locations 350 thru 423. This initialization routine is contained in the subroutine section of the final machine language program.

The form of command is: *POKE (SB+509),57* where SB = start of the subroutines. For example, if the subroutines started at 28900, the proper change to eliminate the initialization routine would be a *POKE 29409,57*.

In summary, this will allow one the necessary lower RAM "hooks" needed to run certain Extended or Disk Color BASIC ROM machine language subroutines within programs compiled with *Intbasic*. *Intbasic* can be obtained from:

(Wasatchware, P.O. Box 510371, SLC, UT $39.95)

—Herbert B. Ridge

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NEW! **MAGIGRAPH** will turn your Color Computer into a graphic design center with the ease of a keystroke! This utility makes it simple to draw highly detailed graphic figures, up to and including an entire graphic screen. Nine animation buffers are provided for you to test and revise the movements of animated figures. To see your creations, just toggle between the design screen and graphic display screen. A full set of logical operation and pixel manipulation functions simplify the development of a figure in all its different possible color and position combinations. Save the graphic screen to cassette or disk for later recall, or send the pixel codes of a graphic image to a printer. If you are an experienced basic or assembly language programmer, you won't want to be without this program! Demonstration programs are included in the comprehensive documentation package. Comes on cassette (16K required) for **$34.95**; disk (32K Extended Color Basic required) for **$39.95** and Amdisk cartridge for **$44.95.**

SYSTEMS SOFTWARE

MACRO-80C

This is a **disk-based editor, macro assembler and monitor**, written for Color Computer by Andy Phelps. THIS IS IT — The ultimate programming tool!

The powerful 2-pass macro assembler features conditional assembly, local labels, include files and cross referenced symbol tables. MACRO-80C supports the complete Motorola 6809 instruction set in standard source format. There are no changes, constraints or shortcuts in the source language definition. Incorporating all of the features of our Rompack-based assembler (SDS80C), MACRO-80C contains many more useful instructions and pseudo-ops which aid the programmer and add power and flexibility. The screen-oriented text editor is designed for efficient and easy editing of assembly language programs. The "Help Key" feature makes it simple and fun to learn to use the editor. As the editor requires no line numbers, you can use the arrow keys to position the cursor anywhere in the file. MACRO-80C allows global changes and moving/copying blocks of text. You can edit lines of assembly source which are longer than 32 characters.

DCBUG is a machine language monitor which allows examining and altering of memory, setting break points, etc.

The editor, assembler and monitor — as well as sample programs — come on one Radio Shack compatible disk. Extensive documentation included. **MACRO-80C Price: $99.95**

SOFTWARE DEVELOPMENT SYSTEM

The Micro Works Software Development System (SDS80C) is a complete 6809 editor, assembler and monitor package contained in one Color Computer program pack! Vastly superior to RAM-based assemblers/editors, the SDS80C is non-volatile, meaning that if your application program bombs, it can't destroy your editor/assembler. Plus it leaves almost all of 16K or 32K RAM free for **your** program. Since all three programs, editor, assembler and monitor are co-resident, we eliminate tedious program loading when going back and forth from editing to assembly and debugging!

The powerful screen-oriented Editor features finds, changes, moves, copys and much more. All keys have convenient auto repeat (typamatic), and since no line numbers are required, the full width of the screen may be used to generate well commented code.

The Assembler features **all** of the following: complete 6809 instruction set; conditional assembly; local labels; assembly to cassette tape or to memory; listing to screen or printer; and mnemonic error codes instead of numbers.

The versatile monitor is tailored for debugging programs generated by the Assembler and Editor. It features examine/change of memory or registers, cassette load and save, breakpoints and more. **SDS80C Price: $89.95**

MICRO WORKS COLOR FORTH

• Forth is faster to program in than Basic • Forth is easier to learn than Assembly Language • Forth executes in less time than Basic.

Forth is a highly interactive language like Basic, with structure like Pascal and execution speed close to that of Assembly Language. The Micro Works Color Forth is a Rompack containing everything you need to run Forth on your Color Computer.

Color Forth consists of the standard FORTH Interest Group (FIG) implementation of the language plus most of FORTH-79. It has a super screen editor with split screen display. Mass storage is on cassette. Color Forth also contains a decompiler and other aids for learning the inner workings of this fascinating language. It will run on 4K, 16K, and 32K computers. Color Forth contains 10K of ROM, leaving *your* RAM for *your* programs! There are simple words to effectively use the Hi-Res Color Computer graphics, joysticks, and sound. The 112-page manual includes a glossary of the system-specific words, a full standard FIG glossary and complete source listing. COLOR FORTH . . . THE BEST! From the leader in Forth, Talbot Microsystems. **Price $109.95.**

MICROTEXT: COMMUNICATIONS VIA YOUR MODEM!

Make your Color Computer an intelligent printing terminal with off-line storage! The Microtext module is just what you'll need for:

— Talking to a timeshare system or information service
— Printing out what is received as it is received
— Saving received text to cassette tape
— Re-displaying the received text even while on-line
— Communications with other computers
— Using your computer as a general-purpose 300-baud terminal
— Downloading programs from other computers

The Microtext module is a program pack containing not only firmware but a second serial port so that both your printer and modem can be connected at the same time. Microtext can be configured for any serial printer that will work with the Color Computer, even if it requires line feeds! But even if you don't have a printer, you can keep a permanent copy of your data by storing to cassette tape. Also, any Radio Shack/Centronics-compatible parallel printer may be used by adding the Micro Works' PI80C parallel interface.

For those of you with special terminal applications, Microtext has selectable parity; it sends odd, even, mark or space. With mark parity (which is default) you can send to computers requiring either seven or eight bits. All 128 ASCII codes can be sent. Exchange programs with other Color Computer users! Basic programs may be downloaded from other computers or timesharing systems.

You'll find many uses for this versatile module! Available in ROMPACK, ready-to-use, for **$59.95**.

MACHINE LANGUAGE

MONITOR TAPE: A cassette tape which allows you to directly access memory, I/O and registers with a formatted hex display. Great for machine language programming, debugging and learning. It can also send/receive RS232 at up to 9600 baud, including host system download/upload. 19 commands in all. Relocatable and reentrant. **CBUG Tape Price: $29.95**

MONITOR ROM: The same program as above, supplied in 2716 EPROM. This allows you to use the entire RAM space. And you don't need to re-load the monitor each time you use it. The EPROM plugs into the Extended Basic ROM Socket or the Romless Pack I. **CBUG ROM Price: $39.95**

SOURCE GENERATOR: This package is a disassembler which runs on the Color Computer and generates your own source listing of the BASIC interpreter ROM. Also included is a documentation package which gives useful ROM entry points, complete memory map, I/O hardware details and more. A 16K system is required for the use of this cassette. **80C Disassembler Price: $49.95**

GAMES

Star Blaster — Blast your way through an asteroid field in this action-packed Hi-Res graphics game. In ROMPACK; requires 16K. **$39.95**

Pac Attack — Try your hand at this challenging game by Computerware, with graphics, sound and action! Cassette requires 16K. **$24.95**

Haywire — Have fun zapping robots with this Hi-Res game by Mark Data Products. Cassette requires 16K. **$24.95**

Dunkey Munkey — Arcade excitement awaits those who dare to conquer the munkey! Joystick and 32K required, by Intellectronics. Cassette: **$24.95**

Colorpede — Great graphics, two-player option, and pause control in this exciting game by Intracolor Communication. Cassette requires 16K. **$29.95**

Adventure — *Black Sanctum* and *Calixto Island* by Mark Data Products. Each cassette requires 16K. **$19.95** each

Cave Hunter — Experience vivid colors, bizarre sounds and eerie creatures in hot pursuit as you wind your way through a cave maze in search of gold treasures. This exciting Hi-Res game by Mark Data Products requires 16K for cassette version. **$24.95**

Starfire — Fly around the planet defending Earthlings from being snatched up by aliens in this challenging game from Intellectronics. Cassette requires 16K: **$21.95**

Doodle Bug — Joystick-controlled Doodle Bugs must move quickly through mazes while being chased by enemy bugs in Hi-Res game by Computerware. Cassette requires 16K: **$24.95**

Astro Blast — You'll need to act fast as you protect Earth from wave after wave of alien invaders in this Hi-Res game by Mark Data. Cassette requires 16K: **$24.95**

BOOKS

6809 Assembly Language Programming, by Lance Leventhal, **$16.95**

TRS-80 Color Computer Graphics, by Don Inman, **$14.95**

Assembly Language Graphics for the TRS-80 Color Computer, by Don Inman, **$14.95**

Starting Forth, by L. Brodie, **$17.95**

HARDWARE

PARALLEL PRINTER INTERFACE — Serial to parallel converter allows use of all standard parallel printers. PI80C plugs into the serial output port, leaving your Rompack slot free. You supply the printer cable. **PI80C Price: $59.95**

MEMORY UPGRADE KITS: For Rev. level E., ET, NC and TDP-100s, we carry 64K chips; upgrading is easy! Eight prime **64K chips** and instructions: **$64.95**

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Avoiding The Avalanche With *Teacher's Aid*

By Steve Blyn
Rainbow Contributing Editor

The school year is well underway. The students have finally settled down to their normal routines. All seems well. What could possibly go wrong at this point? . . . Look out for the avalanche!

If your school system is anything like the ones that I am familiar with, you may very well be beseiged, at this point, with an avalanche of paperwork. It seems that there are more and more reports and forms to fill out each year. Reports that seem to duplicate information for various administrative purposes are ever present. Teachers constantly must refer to the many pupil record cards to fill out this paperwork.

Why can't our computers help us out? They certainly can. There are many fine Database programs that are advertised in *the Rainbow* that are adaptable to classroom needs. If you are interested in any of them, I suggest that you call the company to check whether their product is appropriate to your needs.

Don't be hesitant about telephoning any of the companies that advertise in *the Rainbow*. At Computer Island, we always welcome calls whether they lead to sales or not. These calls keep us more closely in touch with the public and we find out directly what you want and need. Most companies are quite friendly and you will be able to determine beforehand whether you should go through the expense of purchasing their particular product.

This month's program is for those who either cannot spend the money for a professional Data program or for those who will enjoy creating their own simple but adequate teacher's aid program. A teacher will be able to gather the information needed to complete the many required school forms using this program rather than having to filter through many student records with one piece of information here and another there. This program will enable you to customize the types of information that you feel will be needed to help fill out forms or otherwise organize information about your students. The procedures used here could easily be adapted to other areas in the classroom or in the home.

(Steve Blyn teaches both exceptional and gifted children, holds two master's degrees and has won awards for the design of programs to aid the handicapped. He and his wife, Cheryl, own Computer Island.)

We will first need to decide which categories or variables we will include for each student. This program illustrates eight variables. They are named A$, B$, C$ . . . to H$ and represent each child's name, date of birth (D.O.B.), address, phone number, most recent math score, most recent reading score, weight and height. You may, of course, have different variables or a different amount of them.

The computer is alerted to these variables on Line 30. I have *DIMensioned* them to 30 as a typical class size. Use your own *DIM* numbers for your total class register. You can always use a higher *DIM* size. Line 80 will tell the computer to stop reading *DATA* statements when it encounters an A$ using the word "END" instead of a student's name.

A professionally purchased program will, of course, create *DATA* files. This program instead has the information entered in *DATA* lines. One *DATA* line is entered for each student. This method easily gives us an edge in future alphabetizing of the students. No routine is needed as the students' names can easily be entered from the attendance book which is no doubt already in alphabetical order. The last *DATA* line that you enter should have the word "END" as the student's name.

A short menu is included to better help you use this program. You may choose whether: 1) you want to see all of the students' records one at a time in order, or 2) just see one certain student's records, or 3) end the program. By changing the *PRINT* statements to *PRINT#-2*, you may use a printer to get hard copy of these records if the need ever arises.

We hope that this program can help you to get out from under the avalanche of paperwork that most teachers experience. Please feel free to alter the program in any way to meet your individual class' needs, or to use it for any non-school application (Little Leagues, scout groups).

```
220.... 021A
410.....0433
END... 06CE
```

The listing:

```
10 REM"TEACHER'S AIDE"
20 REM"STEVE BLYN,COMPUTER ISLAN
```

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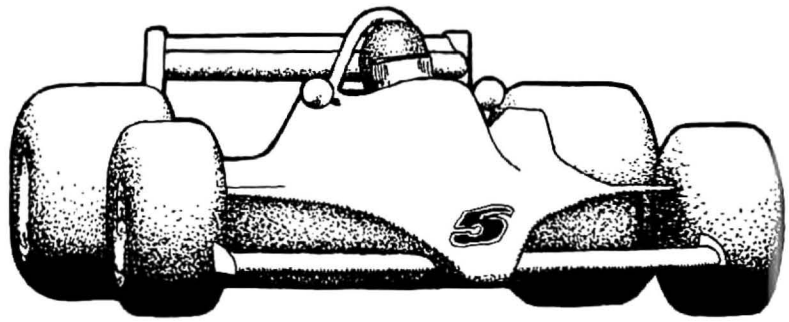
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REVOLUTION!

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The finish line flashes by, and suddenly you are in the pits. The car falls silent. You see your lap times being held up. Your final lap was a new lap record! At last, you permit yourself a small smile.

You have mastered this powerful car on a difficult track, driving with the assurance and precision that comes only from long hours of practice.

You are driving an *authentic* race car. You are playing *Revolution!*

FANTASTIC ACTION

Revolution uses high resolution, machine language graphics for action that is smooth and fast. The emphasis is on authenticity in the control and motion of your car. As in driving a real race car, accuracy and precision in your driving are what counts. Frills and non-essentials have been left out.

PURE COMPETITION

Like a real race driver in practice and qualifying sessions, you compete against the clock and against the existing lap record for that track. *Revolution* records the lap records and the name of the person who set the record, so you always know who reigns supreme on your favorite track!

DESIGNED WITH YOU IN MIND

Revolution is menu-driven, and self explanatory. Information screens tell you what you need to know. When you're ready to play, a menu of the names of all your tracks is displayed, along with the lap record for each track and the name of the person who set that lap record. You select a track with a single keystroke, and *Revolution* takes you there.

A NEW CONCEPT

Revolution is a unique game, because it allows you to create the most important part of any race game: the track itself.

The first time you run *Revolution,* you will be able to choose from several tracks and cars which are included with the game.

But, with *Revolution,* this is only the beginning! You can create as many tracks as you like. You can make each new track as difficult or as easy as you wish. You can make easy ones to begin with, and tougher ones as you become more skilled. You may find creating tracks to be almost as much fun as driving on them!

You can save your favorite tracks to run on again whenever you wish. *Revolution* will automatically add these new tracks to the menu. And you can exchange your favorite tracks with other *Revolution* owners.

Be careful, though, about letting your friends play this game. They may not want to let you have your computer back!

THE EARLY *REVOLUTION*

A prototype version of *Revolution* was published in the September, 1982 issue of Rainbow magazine, under the name *The Track.* The response to *The Track* has been terrific.

Revolution has all the features that have made *The Track* a favorite, and *Revolution*'s fast, high-resolution machine language graphics are dramatically improved over the prototype's.

REVOLUTION NOW!

The original *Revolution* for the TRS-80™ Color Computer requires 32K and one disk drive. A new cassette version has action just like the disk version, and similar track-saving features excluding a menu of available tracks. The cassette version will run on a 32K Color Computer or TDP-100. You can upgrade to the disk version later, too, for a nominal fee.

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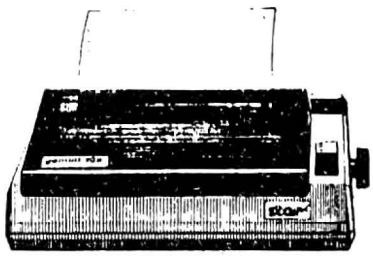
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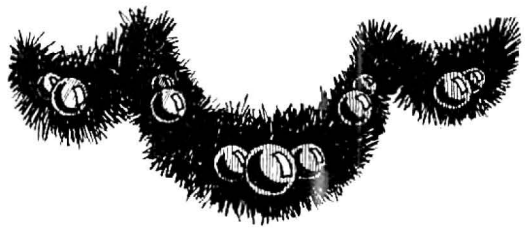
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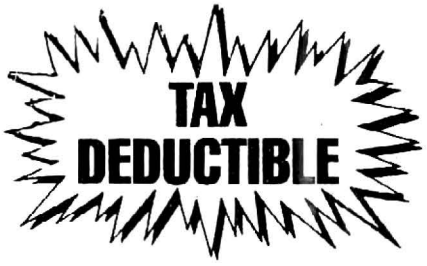
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	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
AU	15	50	13	0	18	57	0	6	0	0	0	0
BU	250	0	167	456	0	0	0	0	0	0	0	0
CC	245	200	280	240	330	310	300	335	325	253	375	115
CI	238	227	0	0	0	242	0	227	0	0	0	0
CL	141	0	0	0	0	0	0	0	0	0	0	0
CO	27	0	25	0	0	0	40	15	0	0	0	0
CP	0	0	0	0	0	150	24	5	178	0	0	0
CR	614	655	357	532	459	1011	2057	361	1322	495	1086	0
CS	110	150	0	50	200	100	160	60	320	390	130	0
FD	248	203	95	115	101	384	128	154	202	0	389	53
FH	0	0	0	0	0	14	0	0	0	0	0	0
HI	0	0	0	0	0	67	0	0	0	0	67	0
HO	0	0	0	0	0	0	0	0	0	1300	1066	791
LI	147	0	218	0	0	440	158	128	0	0	0	0
MD	14	58	1	139	0	60	0	350	61	181	0	0
MG	450	450	450	800	0	900	450	580	475	475	0	0
MI	67	48	90	228	26	167	88	18	14	281	25	80
MZ	0	0	49	11	0	0	0	0	0	30	15	0
PH	54	18	157	0	54	66	67	149	0	88	38	0
TR	0	0	0	95	200	275	0	0	0	0	0	0
UT	178	218	199	159	100	74	98	145	105	87	96	0
XI	0	0	0	399	0	0	405	0	0	0	0	399
XS	2935	3418	3883	2585	4199	6321	3388	3115	2999	6056	3001	2777
ZC	309	0	35	0	786	0	0	0	394	0	0	210
EXP	2798	2276	2102	2825	1487	4396	3532	2557	3017	3581	3288	1039
INC	2935	3418	3883	2985	4199	6321	3793	3115	2999	6056	3001	3177
NET	137	1143	1782	158	2712	1925	261	558	17	2475	-286	2138

TOTAL EXPENSES 32896
TOTAL INCOME 45882
NET 12985

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Faster Stepping Rates

If you own disk drives that can step at a rate faster than 30 milliseconds, or, doubled sided drives, here's some handy information. By changing a few locations you may set the step rate of your drives to six, 12, 20 or 30 milliseconds. By changing two more, you can have the opposite side of drive /d0 appear as drive /d2 and the side opposite drive /d1 appear as /d3.

To make the changes enter OS-9's Debug utility. Then link to the module CCDISK by typing:

DB: L CCDISK

Then move to location 204 by typing:

DB: . .+204

You should see the hex number 22. Change it to 08 by typing an equal sign, a 0 and an 8 immediately following the debuggers prompt. At this point the debugger will move you to location 205. Use the same procedure there to change the 2E to an 8B.

At location 2DD you will find a 43 and at location 2E9 you will find 03. Both of these locations must also be changed to alter the step rate.

Here's the secret: 03 and 43 mean your drives are set up to step at 30 milliseconds. If you change these to 02 and 42 your drives will step at 20 milliseconds; a change to 01 and 41 will give you a 12 millisecond stepping rate, and a 00 and 40 will let you step track to track at six milliseconds if your drives can handle it.

The changes above will increase the speed of your disk operations. If you have double sided drives you can change the code at location 210 and 211 to use the opposite side as an additional device (drive). Change the 04 at location 210 to 41 and change the 40 at location 211 to 42. This will do the trick.

Experiment with these changes and next month we'll show you how to change the locations in the OS-9 boot file so that you may bring OS-9 alive at the new step rates.

BASIC09—The Reason Behind OS-9

Yes, there was a reason behind the development of OS-9. Motorola and Microware needed a very sophisticated operating system that could provide a suitable environment for a state of the art language—BASIC09.

BASIC09 should be available at your local Radio Shack by the time you read this, so we thought we would give you a quick preview and a few sample programs to try. I believe that once you have programmed in BASIC09, you'll never go back to a standard BASIC interpreter.

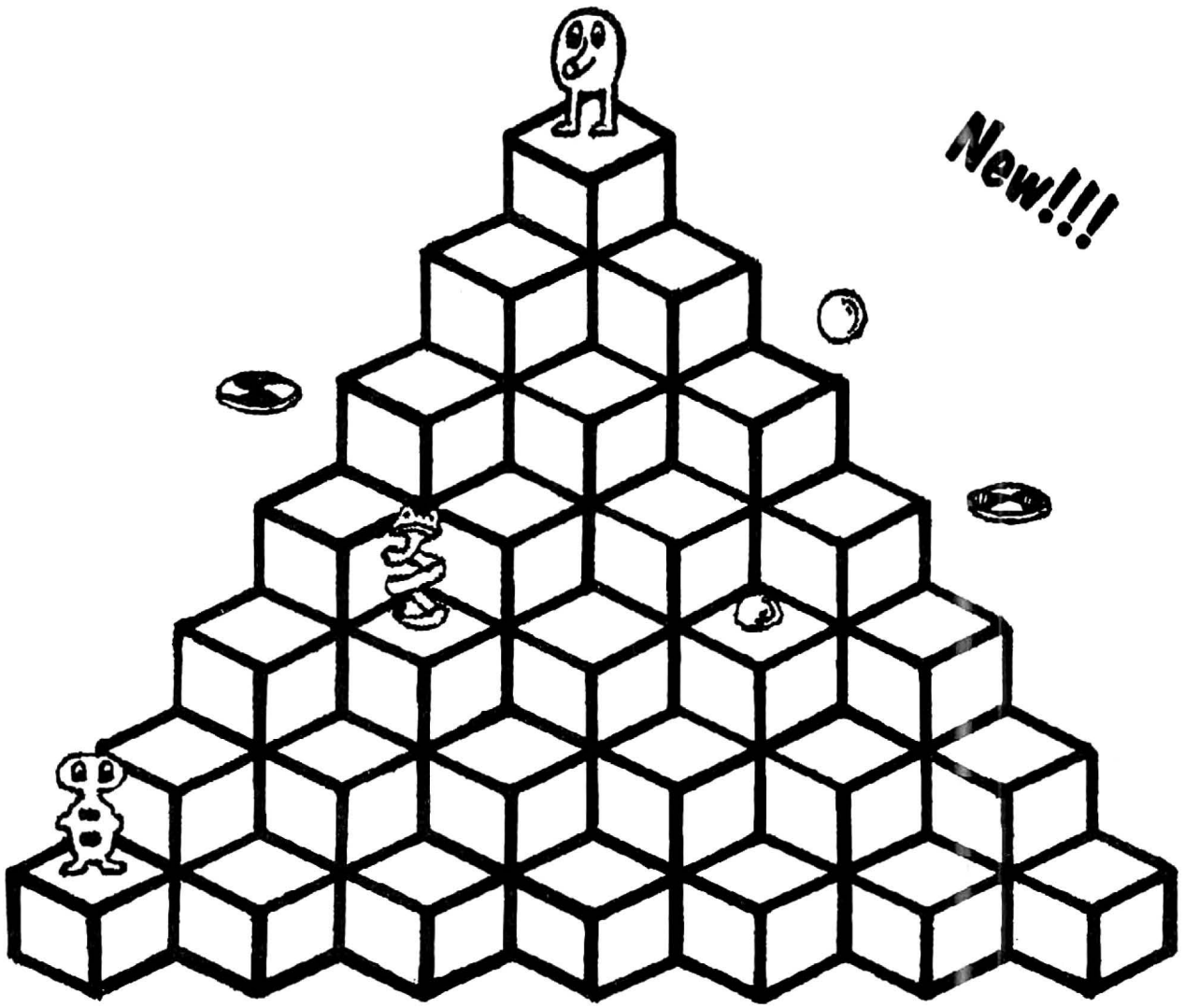
The reason for the success of BASIC09 is the same as the reasoning behind the name of this column. It lets you write structured, readable programs in a friendly environment. Because it contains a built-in editor and debugging aids, it is also highly interactive.

The structure of BASIC09 programs is made possible by its control statements. They're all available: IF/THEN/ELSE, WHILE/ENDWHILE, REPEAT/UNTIL, LOOP/ENDLOOP, AND EXITIF/ENDEXIT. You can simply forget about those confusing line numbers, yet when you need them, you can use them.

And, just as OS-9 uses small modules of code to build a complete operating system, BASIC09 lets you write small pieces of code that you can run over and over again in many different programs. In BASIC09 these small pieces are called procedures.

BASIC09 even lets you define your own data types by combining primitive data types. This encourages you to divide your programs into small procedures because it makes it very easy to pass parameters between procedures.

Q*MAN



Q*MAN hops from cube to cube on a pyramid, changing the cube's colors as he goes. He must watch out for falling balls, sneaky springs and other characters that impede his attempts to change the color of all the cubes. Features multi-levels with multi-rounds of play in high-resolution graphics.

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We'll get into this language more in future columns but this time we'll give you five listings to warm up on. Four of the listings demonstrate the readability and structure of BASIC09 by comparing the same program written in BASIC09 to the same program written in standard BASIC.

The fifth, a utility which I wrote to list the words in the dictionary of *DynaSpell,* illustrates the structure of this language and shows how you can almost program in it by thinking in English. At least you can read it and study it in English. That's a big improvement over "IF a>b THEN 400 ELSE GOTO 50." What'd he say?

Enjoy!

Listing 1 (Standard BASIC)

```
PROCEDURE numberguess
100 REM Number Guessing Game
110 REM To stop type "Control C"

120 PRINT "I will think of a num
ber "
130 PRINT "between 1 and 100 --
"
140 PRINT "You try to guess it!
"
150 n=0
160 x=INT(RND(0)*99+1)
170 PRINT
180 PRINT "What's your guess";
190 INPUT g
200 n=n+1
210 PRINT
220 IF g=x THEN 280
230 IF g>x THEN 260
240 PRINT "Too small, try again"
;
250 GOTO 190
260 PRINT "Too large, try again"
;
270 GOTO 190
280 PRINT "You got it in "; n; "
 tries."
290 IF n>6 THEN 310
300 PRINT "Very good!"
310 PRINT
320 PRINT
330 GOTO 120
340 END
```


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Listing 2 (BASIC09)

```
PROCEDURE numberguess09
 0000
 0001       REM Number Guessing G
ame
 0018
 0019       DIM numberofguesses,r
andomnumber,yourguess:INTEGER
 0028
 0029       PRINT
 002B       PRINT "I will think o
f a number between 1 and 100."
 005A       PRINT "Let's see if y
ou can guess what it is."
 0084
 0085       numberofguesses:=0
 008C       randomnumber:=INT(RND
(1)*99+1)
 009F
 00A0       LOOP
 00A2
 00A3       EXITIF randomnumber=y
ourguess THEN
 00B0         PRINT
 00B2       ENDEXIT
 00B6
 00B7         numberofguesses:=nu
mberofguesses+1
 00C2
 00C3         PRINT
 00C5
 00C6         INPUT "What's your
guess? ",yourguess
 00E1
 00E2         IF yourguess>random
number THEN
 00EF           PRINT "Too high!
 Try Again!"
 0108         ELSE
```

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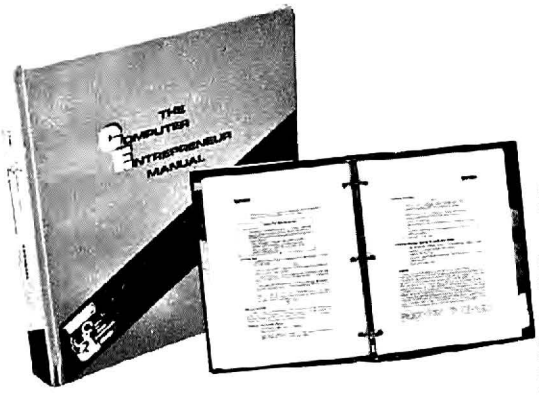
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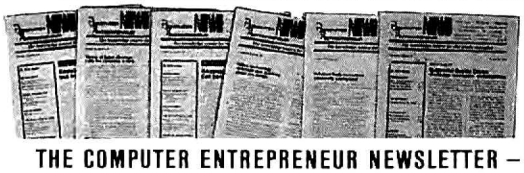
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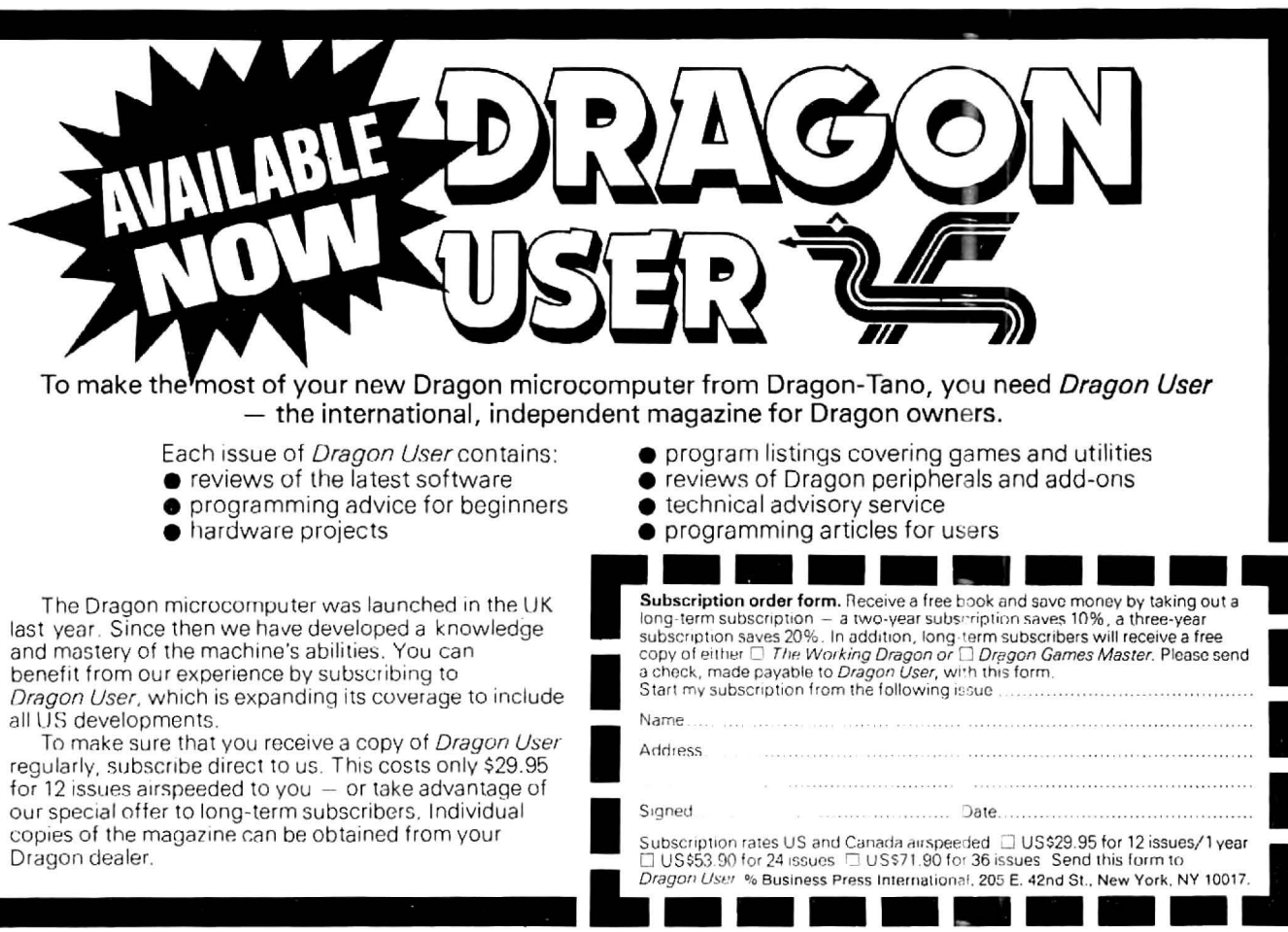
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```
 010C            PRINT "Too low!
Try Again!"
 0124          ENDIF
 0126        ENDLOOP
 012A
 012B        PRINT
 012D
 012E        IF numberofguesses<6
THEN
 013A          PRINT "Very Good!"
 0148        ENDIF
 014A
 014B        PRINT
 014D        PRINT "You got it in
"; numberofguesses; " tries."
 016D        PRINT "Thank you for
playing!"
 0187        PRINT
 0189
 018A        END
```

Listing 3 (Standard BASIC)

```
PROCEDURE quiz
100 REM Multiplication Quiz
110 PRINT "Multiplication Quiz"
120 n=0
130 c=0
140 i=0
150 x=INT(RND(0)*13+1)
160 y=INT(RND(0)*13+1)
170 z=x*y
180 PRINT
190 PRINT x; " times "; y; "=";

200 INPUT w
210 PRINT
220 IF w=z THEN 270
230 PRINT "Whoops!"
240 PRINT "The answer is "; z
250 i=i+1
260 GOTO 290
270 PRINT "You are right!"
280 c=c+1
290 PRINT c; " are right!"
300 PRINT i; " are wrong!"
310 n=n+1
320 IF n<=9 THEN 150
330 IF c>=6 THEN 370
340 PRINT "You flunked the quiz.
"
350 PRINT "Better practice!"
360 GOTO 120
370 IF c>=9 THEN 400
380 PR7NT "You did O.K."
390 GOTO 410
400 PRINT "Nice Job!"
```

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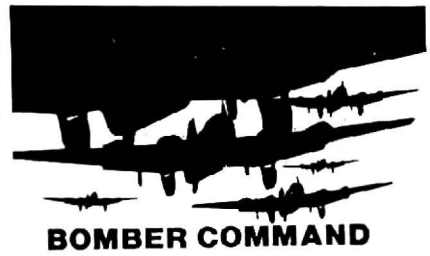
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```
410 PRINT "Try again?"
420 INPUT T$
430 IF T$="y" THEN 120
440 IF T$="Y" THEN 120
450 END
```

Listing 4 (BASIC09)

```
PROCEDURE quiz09
 0000
 0001        (* A Multiplicaton Dr
ill *)
 001C
 001D        DIM counter,correct,w
rong,guess:INTEGER
 0030        DIM firstnumber,secon
dnumber,computersanswer:INTEGER
 003F        DIM query:STRING[1]
 004B
 004C        counter:=0
 0053        correct:=0
 005A        wrong:=0
 0061
 0062        WHILE counter<=9 DO
 006E
 006F          firstnumber:=INT(RN
D(0)*13+1)
 0082          secondnumber:=INT(R
ND(0)*13+1)
 0095          computersanswer:=fi
rstnumber*secondnumber
 00A1
 00A2          PRINT
 00A4          PRINT firstnumber;
" times "; secondnumber; " = ";

 00BE          INPUT guess
 00C3          PRINT
 00C5
 00C6          IF guess=computersa
nswer THEN
 00D3            PRINT "You are ri
ght!"
 00E5            correct:=correct+
1
 00F0          ELSE
 00F4            PRINT "Whoops!"
 00FF            PRINT "The correc
t answer is "; computersanswer
 011D            wrong:=wrong+1
 0128          ENDIF
 012A
 012B          PRINT
 012D          PRINT correct; " ar
e right."
 0140          PRINT wrong; " are
wrong."
 0153          PRINT
 0155
 0156          counter:=counter+1
 0161
 0162        ENDWHILE
 0166
 0167        IF correct>=9 THEN
 0173          PRINT "Nice Job!"
 0180        ELSE
 0184          IF correct>=6 THEN

 0190            PRINT "You did O.
K."
 01A1          ELSE
 01A5            PRINT "You flunke
d the quiz."
 01BE            PRINT "Better Pra
ctice!"
 01D2          ENDIF
 01D4        ENDIF
 01D6
 01D7        PRINT
 01D9        INPUT "Try Again? ",q
uery
 01EC
 01ED        IF query="Y" OR query
="y" THEN
 0202          RUN quiz09
 0206        ENDIF
 0208
 0209        END
```


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Long Beach, California — February 17-19. What a way to get away from the winter doldrums! And what better place than sunny Southern California with thousands of fellow CoCo owners! Fly with CoCo to the sun for the winter. Top flight seminars will draw on many local CoCo experts.

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RAINBOWfest comes to the populous northeast! It's a close drive from New York, Boston, Philadelphia,, Washington, Baltimore and Long Island.

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KEYNOTE: Bob Albrecht

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DATES: March 30—April 1
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KEYNOTE: To Be Announced

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Listing 5

```
PROCEDURE listdictionary
DIM linecounter,counter,dictpath
,printerpath:INTEGER
DIM pageno,char:BYTE
DIM word:STRING[20]

OPEN #dictpath,"/d2/dict.dat":RE
AD
OPEN #printerpath,"/p":WRITE

counter:=0
linecounter:=0
pageno:=0

WHILE NOT(EOF(#dictpath)) DO

PRINT #printerpath \ PRINT #prin
terpath

WHILE linecounter<55 DO

WHILE counter<6 DO

word:=""

REPEAT
GET #dictpath,char
word:=word+CHR$(char)
UNTIL char=13

word:=LEFT$(word,LEN(word)-1)
counter:=counter+1
PRINT #printerpath USING "$19<",
word;

ENDWHILE

PRINT #printerpath
counter:=0
linecounter:=linecounter+1

ENDWHILE

pageno:=pageno+1
PRINT #printerpath
PRINT #printerpath,"Page "; page
no
PRINT #printerpath,CHR$(12)
linecounter:=0

ENDWHILE

CLOSE #dictpath
CLOSE #printerpath

END
```


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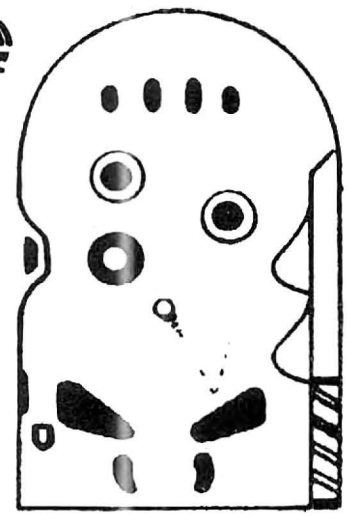
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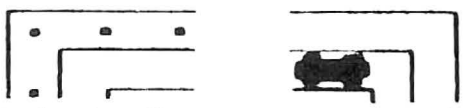


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DEALER AUTHOR INQUIRIES INVITED

Joe Journalist Interviews A Dragon

By Bob Liddil

. . . And gets a dragon's-eye view of a new 64K computer

Here's Joe Journalist, on assignment, visiting the home of that world-renowned celebrity, A. Fearsome Dragon. He has granted us this interview to plug his upcoming project, an exciting new Color Computer, the Dragon, by Tano.

US — Nice to see you again after all these years, A. F. How have you been getting along?

AF — Well, you know how the economy has been for humankind. Unemployment has been beastly for those of us in the animal kingdom. But I manage to get by on savings in between jobs.

US — I hear that you have a new career now. Would you care to tell us about it and what led to your big break?

AF — Well, I had this really cushy job in *The Colossal Cave*, you know, *Original Adventure*. I was getting paid double, once by Microsoft for their version, and once by Scott Adams for his. All I had to do all day was lounge around, munch out on a few adventurers and generally act tough.

US — Sounds like a skate.

AF — Oh, it was. But all of a sudden the TRS-80 Model I/III game market started skidding like a new driver on an icy road. Next stop, the unemployment office. So, then, I signed on as Smaegor the Terrible, with The Programmer's Guild in *Dragonquest*. That's how I got into the TRS-80 Color Computer market. Things started looking up. I posed for a picture as a Cover Dragon in *the Rainbow*, got a couple of bit parts in the movies. Of course, there was always Dungeons and Dragons on the weekends. I really enjoyed ravaging and pillaging in Fantasy Role Playing games, even if it only pays scale.

US — When did your big break come?

AF — Well, I'd been invited to New Orleans to breathe some fire and terrorize Bourbon Street in an annual parade they have there. My agent, Morrie, called me at the hotel and told me I should get myself over to the Tano computer company for an interview with a fellow named Ben. I didn't bother to change out of the Chinese outfit. I just grabbed a cab. I was a little more careful with the second taxi; as soon as they cleared away the wreckage I was on my way.

US — What did they have to say?

AF — Well, Bessie, the receptionist, just screamed and fainted. There was some general panic . . .

US — No, I mean what did Ben have to say?

AF — Oh, Ben. We had quite an interview. He said that The Dragon 64 was coming to America and he wanted a reptilian fellow of considerable repute to represent this terrific new computer. He told me I'd have to make some lifestyle changes, though. No more kidnapping princesses or leveling villages. I can't even terrorize countrysides anymore. It's in the contract that I have to be nice.

> "[Tano's Dragon] . . . is an almost exact TRS-80 Color Computer work-alike. Same BASIC, same machine code, same tape I/O."

US — Wow, tough contract!

AF — For sure. I told them that they must have me confused with my cousin Puff, he's the nice guy in the family. But Ben insisted that they needed me and named a nice retainer that should help pay for this new cave about 10 years sooner.

US — What can you tell us about Tano's Dragon?

AF — It's a nice machine, really. It is an almost exact TRS-80 Color Computer work-alike. Same BASIC, same machine code, same tape I/O. Most TRS-80 Color Computer programs on tape will load right up. You have to use ASCII for the BASIC programs that have been saved on the CoCo and you have to watch the wild calls in the machine language, but I predict that within weeks of release all the CoCo programs of merit will have a Dragon version.

---

*(Bob Liddil, **Captain Eighty**, is a well-known writer on Color Computer topics who has numerous columns and several books to his credit.)*

They're going to market the new computer through selected dealers and quality department stores across the U.S. and Canada. Tano is not interested in mass merchandisers. It wants the Dragon 64 to have a very professional image and doesn't want to compete with units on the toy shelves. All sales people will be trained through classes and video demonstrations. And Tano feels that with TI and Atari losing hundreds of millions of dollars, it will be able to compete in the market by offering the retailer a decent profit margin for a change. It retails for $399 with 64K of memory in it. Not bad, eh?

US — No, not bad at all. Tell us, what are the differences in the Dragon 32 and the Dragon 64?

AF — Well, first, of course, is the added memory. I got some sunglasses and went undercover to peek in on Sir Robert of Woodhaven while he poked around with the 64. On power-up, he got the same old logo — (C)1982 Dragon Data Ltd. — that you get on the 32. And, a ?MEM yielded the familiar 24871. But then he typed EXEC and all of a sudden a different logo appeared.

US — Do go on.

AF — Okay, after he typed EXEC the screen then read "(C)1983 Dragon Data Ltd." Sir Robert concluded that meant that the Dragon 64 has two different states of operation.

US — You mean it has a 32K mode and a 64K mode?

AF — You can quote me on that. Anyway, further investigation with CLEAR0, POKE 32,0, POKE 31,0 and ?MEM returned a value of 49,124 bytes! This is the maximum amount of memory one can expect, since the two ROMs inside require 16K. Curiously, the two ROMs were actually EPROMs and not masked ROMs, which are found in the 32, but then this was an evaluation unit.

US — I guess we could expect masked ROMs in the final production version. Any other discoveries?

AF — Yes, another difference was the addition of a 7-pin DIN serial I/O socket. Since the Dragon 64 already has a parallel printer port, Sir Robert hypothesized that one should be able to print out while on line with a modem. The only other difference I noticed was that the on/off switch was replaced as a channel 3/4 selector switch and the external power supply now had the on/off switch. Sir Robert muttered something about the transistors on the power supply heat sink having screws instead of pop rivets, but I couldn't get too worked up about that.

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S K I L L W A R E

> "Tano expects 250,000 machines to be sold in the first year, and soon to come is a 128K version of the dragon with OS-9 capabilities."

US — What about software for the new computer? The curse of any new home computer is always an appalling lack of software.

AF — Well, according to Jay McClellan, who coordinates software for the Dragon, there will be a heavy emphasis on educational programs as well as light business use. And with graphics and sound capabilities the same as the CoCo, it will also be a good game machine. Plus, it will have software with it already at the time of purchase.

US — Does this mean that Tano will be searching for software?

AF — Oh my, yes. All your readers should watch *the Rainbow* for announcements of program searches and contests. The Tano people will be supporting the new machine to the limit.

US — Well, A. F., you really sound excited by the new Dragon computer.

AF — I am. It could be a hit. Tano expects 250,000 machines to be sold in the first year, and soon to come is a 128K version of the dragon with OS-9 capabilities. Also, I get to keep my job as chief villain in *Dragonquest*. That's one of the games that customers will get free with their Dragon. I have to keep a low profile, though.

US — Well, there you have it folks, straight from the dragon's mouth. The new Dragon computer by Tano will be appearing before Christmas or my name will most assuredly be mud.

This is Joe Journalist packing up the tape recorder after a long, tough day on the job. The new Dragon computer should be a welcome addition to the booming Color Computer marketplace. Amateur and professional programmers alike will have new consumers for their wares.

RAINBOW

Give us your best: Join the ranks of these courageous CoCoists in showing the Color Computer world your high score at your favorite micro-diversion. We want to put your best effort on record in *the Rainbow's* Scoreboard column. All entries must be received by the first of the month to be eligible for the following month's Scoreboard. Each individual is limited to three score entries per month. Send your entries to Scoreboard, c/o *the Rainbow*.

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ASSAULT *(Computer Shack)*
1,100 ★Kevin Mesecher, Ft. Walton Beach, FL

ASTEROID
2,322 ★Matt McMann, New Boston, MI

ASTRO BLAST *(Mark Data)*
158,000 ★Larry Plaxton, Medley, Alberta
157,000 Scott Drake, Pine City, NY
104,464 Jim Baker, Florissant, MO
98,000 Tim Warr, Bellingham, WA
92,000 Harry Sawyer, Watchung, NJ

AVENGER *(The Cornsoft Group)*
24,575 ★Rich McGervey, Morgantown, WV
19,480 Jim Sparke
19,220 Vince Lok, Mississauga, Ontario
16,310 Dave Lubnow, Sussex, NJ
14,075 Stephen Lai, Palatine, IL

BIRD ATTACK *(Tom Mix)*
200,725 ★Peter Niessen, Carlisle, MA
110,850 Chris Sweet, Harvard, MA

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105 ★Matt McMann, New Boston, MI

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387,800 ★Tim Ellis, Overland Park, KS
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95,750 Linda Delisle, N. Adams, MA
75,325 Griffith C. Sombke, Spokane, WA
59,025 Todd DeLisle, N. Adams, MA
46,625 Kathy Wiggenhorn, Coral Springs, FL
45,350 Jennifer Parry, Batavia, IL
37,275 Brad Iowit, Maitland, FL

BUSTOUT *(Radio Shack)*
42,000 ★Derrick Kardos, Colonia, NJ
34,700 Sara Hennessey, Golden Valley, MN
28,720 Perry Denton, New Baden, IL
27,880 Mike Wells, Pittsburgh, PA
17,170 Neil Berkman, DeWitt, NJ

BUZZARD BAIT *(Tom Mix)*
116,450 ★Steve Sentell, Seymour, TN
102,450 Steve Sytsma, Big Rapids, MI

CANYON CLIMBER *(Radio Shack)*
999,900 ★Andre Wagner, Bangor, PA
163,000 Gordy Dow, Bellevue, WA
161,600 Lance Wheeler, Tampa, FL
156,100 David Rodgers, Carbondale, IL
155,900 •Dustin Yates, Shreveport, LA
153,400 Frank Tucher, Abilene, TX
125,000 Doug Schwartz, Glendale, AZ
98,200 Chris Fowler, Crowley, TX

CATCH 'EM *(Aardvark)*
237,000 ★Craig Edelheit, W. Bloomfield, MI
91,000 Dean Bouchard, Kingston, N.S.
70,157 Kirk Beler, Taber, Alberta
65,768 Laura Sandman, Louisville, KY

CATERPILLAR *(Aardvark)*
180,627 ★Brian Panepinto, Spencerport, NY
86,304 Lawrence McElligott, Lancaster, CA
75,861 Michael McClure, Goose Creek, SC
63,100 Todd Byington, N. Salt Lake, UT
54,608 Lawrence McElligott, Lancaster, CA

CAVE HUNTER *(Mark Data)*
42,600 ★Gary Ritchie, Bellevue, Alberta
40,600 Lori Raskob, Esalon, CA
27,050 Jim Baker, Florissant, MO
26,300 Mike Hughey, King George, VA
21,150 Jim Baker, Florissant, MO

CLOWNS & BALLOONS *(Radio Shack)*
85,680 ★Teresa Stutsman, N. Little Rock, AR
83,710 Don Fraser, Shakope, MN
77,910 Dan James, Clearwater, FL
74,920 Sal Barlett, Mesa, AZ
74,600 Jimmy Kendall, Elkview, WV

COLOR CUBES (Radio Shack)
4:50 ★John Handis
6:05 Chris Cope, Central, SC

COLOR HAYWIRE *(Mark Data)*
22,050 ★Jim Baker, Florissant, MO
17,850 Brian Wallingford, Fall River, MA
14,850 Michael Rhattigan, Cary, NC
14,750 Rich McGervey, Morgantown, WV
12,450 Chris Coyle, Selden, NY
4,50 Bruce Kothmann, Pittsburgh, PA

COLOR INVADERS *(Computerware)*
240,700 ★Roland Hendel, Mississauga, Ontario
227,050 John Osborne, Kincardine, Ontario
217,635 Jim Baker, Florissant, MO
126,350 Perry Denton, New Baden, IL
93,510 Rich McGervey, Morgantown, WV

COLOR METEROIDS *(Spectral Associates)*
1,496,000 ★Craig Edelheit, W. Bloomfield, MI
1,253,200 Jeff White, Prairie de Chien, WI
292,000 Roland Hendel, Mississauga, Ontario
292,000 Vince Lok, Mississauga, Ontario
252,050 Larry Plaxton, Medley, Ontario

COLOR OUTHOUSE *(Computer Shack)*
35,908 ★Ron Rhead, Ontario, Canada

COLORPEDE *(Intracolor)*
10,000,000 ★Roland Hendel, Mississauga, Ont.
3,355,248 •Scott Drake, Pine City, NY
2,745,982 Roland Hendel, Mississauga, Ontario
2,547,299 Rich McGervey, Morgantown, WV
2,471,342 Vincent Lok, Ontario.
1,196,669 Alan Tepfer, Ft. Wayne, IN
507,263 Margaret Dunlap, Trail, BC
149,699 David Richardson, Beringham, AL

COLOR SCARFMAN *(The Cornsoft Group)*
976,520 ★Bruce Thornhill, Barrhead, Alberta
772,000 Keith Seifried, Greenville, OH
600,410 Roland Hendel, Mississauga, Ontario
539,100 Larry Plaxton, Medley, Alberta
530,200 Alan Klotzback, Plainesville, OH

COLOR ZAP *(Spectral Associates)*
227,330 ★Ron Rhead, Willowdale, Ontario
84,400 Chris Sweet, Harvard, MA
82,710 Neil Berkman, DeWitt, NY
50,800 Scott Sehlhorst, Columbia, SC

COLOUR PAC ATTACK *(Computerware)*
472,465 ★Jim Baker, Florissant, MO
211,000 Roland Hendel, Mississauga, Ontario
193,000 Cameron Amick, Reisterstown, MD
189,540 Mark Nichols, Birsay, Saskatchewan
154,600 Greg Lesher, North Chili, NY
48,850 David Rodgers, Carbondale, IL

CONQUEST OF KZIRGLA *(Rainbow Connection Software)*
50,199 ★Bruce Uher, Coshocton, OH
10,399 Scott Sehlhorst, Columbia, SC

COSMIC CLONES *(Mark Data)*
41,300 ★John Osborne, Kincardine, Ontario

CROSSWORDS *(Radio Shack)*
864 ★Bob Strang, Chicago, IL

DEATH TRAP *(Soft Sector)*
89,035 ★Keith Philabaum, Coschocton, OH
84,672 •Sandra Willard
78,234 Richard Grondin, Flint, MI
75,431 Jeff Willard, Chireno, TX
41,490 M. A. Brickler, Allen Park, MI

DEFENSE *(Spectral Associates)*
68,750 ★M. A. Brickler, Allen Park, MI
58,900 •Greg Scott, Orlando, FL

DOODLEBUG *(Computerware)*
3,011,320 ★Brenda Gaetz, Gillane, Manitoba
2,248,840 •Donut, Tabor, IA
1,580,000 J.W. Panks, Indianapolis, IN
1,577,320 Bobby Bruce, Springfield, MO
1,265,580 Lawrence McElligott, Lancaster, CA

DOUBLEBACK *(Radio Shack)*
1,080,000 ★Phillipe Duplanties, St. Jerome, Quebec
605,890 Peter Sherburne, Highland, CA
474,040 Paul Moritz, Butte, MT
435,570 Phillippe Morsan, St. Jerome, Quebec
429,000 Steve Damm, Phoenix, AZ
228,120 Darrin Filand, Duxburg, MA
151,190 Alfredo Santos, New York, NT
127,910 John Bishop, Charlotte, NC
123,560 Heather Gach, Anniston, AL
120,620 Mary Gach, Anniston, AL
62,150 Pam Santos, New York, NY

DUNKEY MUNKEY *(Intollectronics)*
3,214,200 ★Rich McGervey, Morgantown, WV
1,924,000 Andrew Herron, High Point, NC
1,679,400 Brian Jones, Story City, IA
1,618,800 Bryan Bloodworth, Federal Way, WA
1,437,200 Mike Wells, Pittsburgh, PA

FAST LANE *(Ace Soft Computer Products)*
23,782 ★Philip Deen, Enterprise, FL
93 Marie Love, Columbia, SC

FIRECOPTER *(Adventure International)*
113,880 ★Steve Skrzyniarz, Tacoma, WA
89,260 Robbie Black, Winnipeg, Manitoba
74,640 Cameron Amick, Reisterstown, MD

FLYBY
3,670 ★Cameron Amick, Reisterstown, MD

THE FROG *(Tom Mix)*
73,350 ★Evelyn Gagnon, Ontario, Canada
66,480 Jeannie Hawkins, Deltona, FL
46,560 Eileen Kaakee, Royal Oak, MI
36,260 Chris Coyle, Selden, NY

FROGGER *(The Cornsoft Group)*
32,010 ★Laura Schooley, Richmond, VA
25,425 Kanti Dinda, Kingston, Ontario
20,745 Felicia Schooley, Richmond, VA
18,575 Tamara Schooley, Richmond, VA
17,945 Steve Skrzyniarz, Tacoma, WA
9,450 Nigel Wakelin, Mt. Lebanon, PA
4,800 Carlos Lee, APO, NY

FROG-MAN *(Computer Island)*
3,735 ★Aaron T. Cincotta, Peru, IN

FROG TREK *(Oelrich Publications)*
14,700 ★Greg Burke, Kenora, Ontario
14,080 Alan Weiss, Summit, NJ
11,200 Jim Partridge, Clinton, CT
10,370 Jim Baker, Florissant, MO
8,550 Tom Eberhardt, Fairview Park, OH

FURY *(Computer Shack)*
83,500 ★Hans Haimberger, Milton Freewater, OR
54,300 •Hans Haimberger, Freewater, Ontario

GALACTIC ATTACK *(Radio Shack)*
67,750 ★Chuck Gaudette, Monroe, CT
58,000 Terry Steen, San Bernadino, CA
55,360 Donald Thompson, Lubbock, TX
54,200 Mike Hughey, King George, VA
54,000 Craig Edelheit, W. Bloomfield, MI
12,600 Roger Rothoue, Warrensburg, MO

SCOREBOARD

GALAX ATTAX *(Spectral Associates)*
82,650 ★Steve Hargis, Tucson, AZ
73,000 Wes Hill, Vashon, WA
66,750 Jim Wolf, South Bend, IN
65,700 Steve Otis, Graham, WA
60,950 Dennis Goehring, Mississauga, Ontario
46,600 Aaron Cundiff, Livermore, KY
42,300 Stanley Vance, Livermore, KY
33,800 Todd Zuehl, Livermore, KY

GHOST GOBBLER *(Spectral Associates)*
1,007,430 ★Todd Brannam, Charleston Hts., SC
825,250 Randy Gerber, Wilmette, IL
423,390 Rich McGervey, Morgantown, WV
255,000 John Osborne, Kincardine, Ontario
142,070 Chris Kulawy, St. Johnsville, NY
140,290 Carlos Lee, APO, NY
101,880 Nancy Record, Jaffrey, NH
79,060 Bernd Pruetting, West Germany

GOLF *(Aardvark)*
40 ★Matthew Brenengen, Lakelmo, MN

GRABBER *(Tom Mix)*
440,000 ★Casey Stein, Binghamton, NY
50,250 ●Doug Rodger, Harvard, MA
44,100 Steve Skrzyniarz, Tacoma, WA
31,200 Cameron Amick, Reisterstown, MD
30,600 Phil Calandrino, Springfield, IL

GRANPRIX *(Computerware)*
5,875 ★Steve Skrzyniarz, Tacoma, WA

HAIDER KHAZEN
81,000 ★David Karam, Austin, TX

HALL *(Chromasette)*
3,650 ★Michael McCafferty, Idaho Falls, ID

INVADERS REVENGE *(Med Systems)*
1,334,300 ★Richard Grondin, Flint, MI
502,360 ●John Osborne, Kincardine, Ontario
32,600 Harry Sawyer, Watchung, NJ
16,300 Eric Lund, Millington, NJ

JUNIOR'S REVENGE *(Computerware)*
1,115,300 ★Ryan Van Manen, Grand Rapids, MI
144,200 Rich Van Manen, Grand Rapids, MI

KATERPILLAR ATTACK *(Tom Mix)*
163,526 ★Andy Truesdale, Ferguson, MO
109,247 Jamie Gritton, Irvine, CA
20,530 Jennifer Parry, Batavia, IL
14,375 Norbert Berenyi, Northvale, NJ
14,211 Roland Hendel, Mississauga, Ontario
11,407 Nigel Wakelin, Mt. Lebanon, PA
9,219 Bernd Pruetting, West Germany
8,504 Chris Leonard, Minoa, NY

KEYS OF THE WIZARD *(Spectral Associates)*
640 ★Steve Skrzyniarz, Tacoma, WA

THE KING *(Tom Mix)*
10,000,000 ★Roland Hendel, Ont.
4,040,300 ●Andy Truesdale, Ferguson, MO
2,410,200 Candy Harden, Birmingham, AL
2,213,000 James Quadarella, Brooklyn, NY
2,017,700 Donut, Tabor, IA
1,489,200 Alex State, Las Vegas, NV
235,600 James Maxnard, Edinburg, TX
137,900 Chad Kneisel, Tunkhannock, PA
83,900 Kevin Delisle, N. Adams, MA

KRON *(Oregon Color Computers)*
62,100 James Hill, Red Bluff, CA

KOSMIC KAMIKAZE *(IMB)*
200,550 ★Fred Iha, Columbus AFB, MS
62,250 Beth Walker, Gloucester Pt., VA
55,000 Paul Morris, Richland, WA
49,900 Mark Raphael, Englishtown, NJ
30,450 Jeff Teague, Noblesville, IN

LANCER *(Spectral Associates)*
2,354,000 ★Alex State, Las Vegas, NV
474,250 ●Mike Rausch, Denver, CO
469,400 Jeff Jackson, Littleton, CO
462,100 Scott Jackson, Littleton, CO
183,050 Larry Sandhaas, Springfield, IL
89,850 Michael MacKenzie, Sicamous, BC
87,000 Stephen Ollinger, Sicamous, BC
86,450 Bill Gwynne, Cincinnati, OH
78,350 Daniel Milbrath, Ann Arbor, MI
75,950 Richard Uglum
59,050 Gordy Dow, Bellevue, WA

LUNAR ROVER PATROL *(Spectral Associates)*
46,800 ★Daniel Milbrath, Ann Arbor, MI
45,500 Kevin Davidson, Easley, SC
34,000 Dann Fabian, Crestview, FL

MEGA-BUG *(Radio Shack)*
60,000 ★Robin Worthem, Milwaukee, WI
16,632 John Tiffany, Washington, D.C.
15,999 Ed Mitchell, Ragged Mountain, CO
14,297 Aleisha Hemphill, Los Angeles, CA
13,852 Ryan Van Manen, Grand Rapids, MI
7,992 Richard Vehlow, Bayside, NY
6,870 Stephanie Morgan, Centerville, OH
5,072 Doug Schwartz, Glendale, AZ
4,641 Chad Kneisel, Tunkhannock, PA

MEGAPEDE *(Computerware)*
94,085 ★Mark Eimer, Oceanside, CA
89,036 ●Mark Skala, Fairview, PA
67,605 Ed Bottini, St. Louis, MO
58,070 Rich Van Manen, Grand Rapids, MI
55,291 Ryan Van Manen, Grand Rapids, MI
53,692 Robbie Black, Winnipeg, Manitoba

METEOROIDS *(Spectral Associates)*
140,210 ★Fred Iha, Columbus AFB, MS

METEORS
403,000 ★Jimmy Chan, Kincardine, Ontario
17,810 Lenny Munitz, Bellerose, NY
13,120 Jennifer Klamp, Winter Park, FL

MICROBES *(Radio Shack)*
318,830 ★Hwan Joo, Weston, Ontario
316,200 Steve Mayer & Keith Seifried, Greenville, OH
259,700 Sheila Coleman, Griffin, GA
258,150 Rick Van Manen, Grand Rapids, MI
244,700 Ian Waters, North Hero, VT

MR. MUNCH
40,000 ★Wes Hill, Vashon, WA
20,000 Scott Drake, Pine City, NY

MONKEY KONG *(Med Systems Software)*
1,000,000 ★Wes Hill, Vashon, WA
1,876 Kanti Dinda, Kingston, Ontario
1,323 Ryan Van Manen, Grand Rapids, MI
1,210 Susan Brink, Portage, MI
1,185 Mike Fath, Wadsworth, OH

MONSTER MAZE *(Radio Shack)*
520,470 ★Robert L. Bull, Trenton, Ontario
323,490 Philip Morrissey, Gilboa, NY
200,000 Daniel Milbrath, Ann Arbor, MI
150,000 Jamie Gritton, Irvine, CA
130,780 Dylan Kucera, Manitoba
9,600 Kitty Gach, Anniston, AL

MOON HOPPER *(Computerware)*
6,210,000 ★Vincent Lok, Ontario
809,750 ●Ed Bottini, St. Louis, MO
142,800 Ron Rhead, Willowdale, Ontario
122,500 Donut, Tabor, IA
100,640 Cameron Amick, Reisterstown, MD

MOROCCO GRAN PRIX *(Computerware)*
4,153 ★Frank Bottini, St. Louis, MO
2,344 Cameron Amick, Reisterstown, MD

NERBLE FORCE *(Computerware)*
315,150 ★Frank Bottini, St. Louis, MO
49,200 Jim Ganninger, Des Peres, MO

NIBBLER *(Color Quest)*
20,650 ★Rick McGervey, Morgantown, WV
14,910 ●Christal Glovinsky, Staten Island, NY

NINJA WARRIOR *(The Programmer's Guild)*
74,500 ★Greg Burke, Kenora, Ontario
42,400 Daniel Milbrath, Ann Arbor, MI
39,900 Dennis Teague, Noblesville, IN
29,700 Damon Frazier, Bringhurst, IN
27,500 Jeff Teague, Noblesville, IN

OFFENDER *(American Business Computers)*
999,900 ★Scott Drake, Pine City, NY
965,400 ●Jim Baker, Florissant, MO
406,800 Betty Moore, Greensburg, PA
293,900 Marla Moore, Greensburg, PA
273,900 Walt Moore, Greensburg, PA

PAC-ATTACK II *(Computerware)*
107,070 ★Mark Skala, Fairview, PA
88,860 Michael J. Garozzo, Morrisville, PA
62,870 ●Stanley Sneed, Erwin, TN
44,000 Robert Lang, Port McNeill, BC
42,045 Dave Lubnow, Sussex, NJ

PAC-DROIDS *(The Programmer's Guild)*
1,476,730 ★Joshua Josephson, Corning, NY
577,140 Richard Cochrane, Wayne, NJ
197,490 Joe Minkstein, Jr., Half Moon Bay, CA
151,590 Annita Powell, Huber Heights, OH
140,300 John Yapp, Park Forest, IL

PACET-MAN *(American Business Computers)*
26,800 ★Vince Lok, Mississauga, Ontario
14,050 Susan Brink, Portage, MI
7,200 Fred Iha, Columbus AFB, MS
5,000 Cameron Amick, Reisterstown, MD
3,392 Norbert Berenyi, Northvale, NJ

PARACHUTE JUMP *(JARB Software)*
451,000 ★John Osborne, Kincardine, Ontario

PATTIPAK *(Petrocci Freelance)*
33,545 Bruck Kothmann, Pittsburgh, PA

PHANTOM SLAYER *(Med Systems)*
2,488 ★Troy Messer, Joplin, MO
1,306 ●Marc Hassler
604 J. Powell, Bournemouth, England
406 Imre Kertesz, Chandler, AZ
197 Mark Heizler, Ridgefield, CT

PICNIC *(Computer Island)*
100,000 ★Scott Drake, Pine City, NY
1,220 Jon Bauch, South Fallsburgh, NY

PINBALL *(Radio Shack)*
6,000,000 ★Jimmy Oliver, Hants City, NS
4,000,000 ●Keith Seifried, Greenville, OH
2,111,900 Dale Westmoreland, Lannon, WI
1,266,250 Donut, Tabor, IA
300,250 Brad Widdup, Dundas, Ontario
170,300 Walter Brokx

PLANET INVASION *(Spectral Associates)*
483,250 ★Chris Sweet, Harvard, MA
286,075 ●Larry Plaxton, Medley, Alberta
257,900 Ron Rhead, Willowdale, Ontario
221,350 John Cole, King City, Ontario
106,500 Jimmy Oliver, Hants City, NS

PLANET RAIDERS *(Aardvark)*
16,770,300 ★Michael Moruzi, Sudbury, Ont.
2,010,900 ●Bill Messerick, S. St. Paul, MN

POLARIS *(Radio Shack)*
256,018 ★Michael Popovich, Sr., Nashua, NH
218,450 Allen Roth, Dayton, TX
212,746 Hwan Joo, Weston, Ontario
170,100 Steve Johnson, Santa Ana, CA
151,154 Brian Austin, Rotterdam, NY
101,746 Jimmy Oliver, Hants City, NS
39,746 Steve Curnow, Woodbury, MN
7,317 Roger Rothoue, Warrensburg, MO

POLTERGEIST *(Radio Shack)*
6,455 ★Rich Van Manen, Grand Rapids, MI
4,970 Tim Warr, Bellingham, WA
4,950 Mark Dowling, San Bruno, CA
4,865 John Osborne, Kincardine, Ontario
4,860 Lori Raskob, Esalon, CA
4,515 Gordy Dow, Bellevue, WA

POPCORN *(Radio Shack)*
560,900 ★Vince Lok, Mississauga, Ontario
168,680 Steve Johnson, Santa Ana, CA
136,530 Scott Sehlhorst, Columbia, SC
110,570 Cameron Amick, Reistertown, MD
96,470 Mike Wells, Pittsburgh, PA
36,780 Richard Vehlow, Bayside, NY

PROJECT NEBULA
430 ★Dale Westmoreland, Lannon, WI

PROTECTORS *(Tom Mix)*
594,610 ★Roland Hendel, Mississauga, Ontario
358,514 Cameron Amick, Reisterstown, MD
275,810 Julian Bond, Berkeley, CA
272,000 Douglas Hug, Roseville, CA
217,000 Ian Waters, North Hero, VT

continued

MORE... RAINBOW SCOREBOARD

PYRAMID *(Radio Shack)*
165 ★Dale Westmoreland, Lannon, WI

QUEST
2,200,00 B.J. Bardy, Mt. Lebanon, PA
1,000,000 Nigel Wakelin, Mt. Lebanon, PA

RAIL RUNNER *(Computerware)*
53,520 ★Jim Baker, Florissant, MO
53,400 Ed Bottini, St. Louis, MO
20,910 Nigel Wakelin, Mt. Lebanon, PA
19,400 Chris Sweet, Harvard, MA
15,520 Kirk Mesecher, Ft. Walton Beach, FL

ROBOT BATTLE *(Spectral Associates)*
21,000 ★Bobby Bruce, Springfield, MO

ROBOTTACK *(Intracolor)*
1,512,200 ★Robert Kiser, Monticello, MS
1,424,300 John Osborne, Kincardine, Ont.
1,219,810 Steve Skrzyniarz, Tacoma, WA
1,197,800 Brian Austin, Rotterdam, Ny
1,146,750 Justin Marcus
614,500 Mark Pettigrew

SANDS OF EGYPT *(Radio Shack)*
121 ★Grant Gillot, Calgary, Alberta
88 Mike Rausch, Denver, CO

SCARFMAN *(Cornsoft)*
495,440 ★Woody Farmer, Alberta, Canada
371,540 ●Stanley Sneed, Erwin, TN
121,600 M. A. Brickles, Allen Park, MI

SEA DRAGON *(Adventure International)*
60,430 ★Steve Skrzyniarz, Tacoma, WA
36,540 Steve Schweitzer, Sewell, NJ
27,500 Wes Hill, Vashon, WA
23,750 Stephen Harden, Birmingham, AL
15,300 Derek Keener, Columbus, OH

SHAFT *(Prickly-Pear Software)*
18,150 ★Loren Seng, Tuscon, AZ
17,160 Julian Bond, Berkely, CA

SHARK TREASURE *(Computerware)*
172,000 ★Aaron Peele, Benington, VT
150,000 Lori Raskob, Esalon, CA
72,000 ●Marc Hassler
50,000 Jennifer Klamp, Winter Park, FL

SHOOTING GALLERY *(Radio Shack)*
37,300 ★Mark Nichols, Birsay, Saskatchewan
37,200 Chris Kulawy, St. Johnsville, NY
37,080 Gary Long, Peru, NY
33,060 Mrs. Merle Burzynski, Erie, MI
31,330 R. Dugway, St. Bruno, Quebeck

SKIING *(Radio Shack)*
31.52 ★Andy Truesdale, Ferguson, MO
35.89 Peter Johnson, Chino, CA
40.10 Fred Herrmann, Flemington, NJ
49.43 John Scanlan, Prairie Village, KS

SKY DEFENSE *(Quasar Animations)*
9,700 ★Vince Lok, Mississauga, Ontario
6,700 Mike Anheluk, Fall Creek, OR
6,120 Steve Skrzyniarz, Tacoma, WA
5,200 Cameron Amick, Reisterstown, MD

SNAIL'S REVENGE *(the Rainbow)*
510 ★Matt Luck, McLean, VA
420 Christie James, Ashland, VA

SOLO POKER *(Radio Shack)*
830 ★Aldona Rastenis, Euclid, OH
830 ★Fran Tucher, Albilene, TX
670 Granville Bonyata, Tallahassee, FL
640 ●Mary J. Herring, Bloomington, IL
640 ●Stephen Jenkick, Pittsburgh, PA

SOLO POOL *(Tom Mix)*
110 ★Bill Steelman, Edmonds, WA
103 ●John Fraysse, Dahlren, VA
83 Sarah Wakelin, Mt. Lebanon, PA

SPACE ACE *(Spectral Associates)*
983 ★Matt McMann, New Boston, MI

SPACE AMBUSH *(Computerware)*
403,350 ★Jimmy Chan, Kincardine, Ontario
124,460 ●John Osborne, Kincardine, Ontario

SPACE ASSAULT *(Radio Shack)*
1,632,450 ★Walter Brokx, Granisle, BC
358,660 ●Mike Snelgrove, Oshawa, Ontario
238,580 John Cole, King City, Ontario
224,130 Derrick Kardos, Colonia, NJ
221,130 Steve Johnson,Santa Ana, CA
200,000 Bernd Pruetting, West Germany
6,000 Roger Rothoue, Warrensburg, MO

SPACE INVADERS *(Spectral Associates)*
1,496,030 ★Jimmy Chan, Kincardine, Ontario
62,300 Peter Niessen, Carlisle, MA
54,980 Susan Brink, Portage, MI
53,930 Linda Delisle, N. Adams, MA
29,560 Greg Brink, Portage, MI

SPACE RACE *(Spectral Associates)*
83,750 ★John Osborne, Kincardine, Ontario
62,875 Shane Deike, Bolmo, TX
59,825 Jim Baker, Florissant, MO
58,100 John Cole, King City, Ontario
55,625 Steve Skrzyniarz, Tacoma, WA
4,650 Richard Vehlow, Bayside, NY

SPACE RAIDERS *(Mark Data)*
112,100 ★Jimmy Chan, Kincardine, Ontario

SPACE SENTRY *(Spectral Associates)*
41,129 ★Steve Skrzyniarz, Tacoma, WA
2,625 Cameron Amick, Reisterstown, MD

SPACE SHUTTLE *(Tom Mix)*
595 ★Steve Schweitzer, Sewell, NJ
575 Fred Weissman, Brookline, MA
571 Ted McDonald, Summerville, SC
566 Tim Smith, San Rafael, CA
562 Kenton Fifield, Ft. Frances, Ontario

SPACE WAR *(Spectral Associates)*
400,190 ★Mark Felps, Bedford, TX
116,000 Peter Niessen, Carlisle, MA
52,380 Jim Baker, Florissant, MO
16,500 Chris Leek, Martintown, Ontario
11,540 David Iverson, Dorval, Quebec

STARBASE ATTACK *(IMB)*
328,000 ★Paul Morris, Richland, VA
62,551 ●Chris Coyle, Selden, NY
60,602 Beth Walker, Gloucester Pt., VA
35,659 Dennis Teague, Noblesville, IN
24,668 J.W. Panks, Indianapolis, IN

STARBLASTER *(Micro Works)*
408,245 ★Mark Dowling, San Bruno, CA
325,790 Mike Anheluk, Fall Creek, OR
126,135 Mike Hall, Hartland, WI
80,001 Alan Lewis, Ridgefield, CT
35,400 Peter Niessen, Carlisle, MA

STARFIRE *(Intellectronics)*
10,000,000 ★Roland Hendel, Ontario
3,444,500 ●John DeMuth, Prairie de Chien, WI
2,102,450 Dean Bouchard, Kingston, N.S.
1,320,150 Joy Bailey, Lexington, NC

STARSHIP CHAMELEON *(Computerware)*
861,200 ★Greg Lesher, North Chili, NY
82,200 Chris Sweet, Harvard, MA
79,250 Vince Lok, Mississauga, Ontario
75,500 Ron Pinson, Guelph, Ontario
72,600 Jim Baker, Florissant, MO

STORM *(Computerware)*
840,010 ★Roland Hendel, Mississauga, Ontario
723,335 Chris Sweet, Harvard, MA
472,320 John Jaworski, Nashua, NY
380,000 Cameron Amick, Reisterstown, MD
312,000 Dave Lubnow, Sussex, NJ
89,650 Bruce Kothmann, Pittsburgh, PA

STORM ARROWS *(Spectral Associates)*
94,000 ★Steven Ohsie, Houston, TX
22,200 Cameron Amick, Reisterstown, MD

TEEEOFFF *(Prickly-Pear Software)*
32 ★Mark Wright, Tipton, MI

TRAPFALL *(Tom Mix)*
113,408 ★Rich Trawick, N. Adams, MI
104,368 John Osborne, Kincardine, Ontario
98,588 Dan Burch, Louisville, KY
96,800 Bruce March, Barrie, Ontario
90,146 Neil Berkman, DeWitt, NY
87,000 Chad Kneisel, Tunkhannock, PA
50,256 Mark Pettigrew

VENTURER *(Aardvark)*
4,126,200 ★Greg Scott, Orlando, FL
2,291,100 Mike Sitzer, Roslyn, NY
2,657,350 ●Brian Panepinto, Spencerport, NY
2,152,150 Greg Scott, Orlando, FL
1,769,400 Todd Hauschildt, Red Wing, MN
1,526,200 Peter Niessen, Carlisle, MA
1,126,550 Hwan Joo, Weston, Ontario

WHIRLYBIRD RUN *(Spectral Associates)*
516,450 ★Dan Shargel, Arroyo Grande, CA
103,900 Dann Fabian, Crestview, FL
98,400 ●Dave Lubnow, Sussex, NJ
48,000 Todd Brannam, Charleston Hts., SC
44,900 John McClennan, Holliston, MA
29,800 Robbie Black, Winipeg, Manitoba

WILDCATTING *(Radio Shack)*
48,682 ★David Rodgers, Carbondale, IL
30,555 ●Gary Jones, Dale, TX
29,854 Matt Buist, Bangor, PA
29,137 Andre Wagner, Bangor, PA
28,842 Kay Jinkich, Pittsburgh, PA

ZAKSUND *(Elite Software)*
1,128,050 ★Richard Minton, West Frankfort, IL
1,008,100 Andy Mickelson, Granville, OH
950,500 ●Michael Rothman, Solon, OH
876,200 John Osborne, Kincardine, Ontario
617,500 Ed Bottini, St. Louis, MO

ZAPEM *(Chromaselte)*
12,950 ★Michael McCafferty, Idaho Falls, ID

ZAXXON *(Datasoft)*
2,000,000 ★Roland Hendel, Mississauga, Ontario
1,510,000 James Quadarella, Brooklyn, NY
401,900 Mike Hughey, King George, VA
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111,300 Joey Roy, Durham, NC
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82,200 Mark Pars, Aldergrove, BC
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Polygons? Gollygons!

By R. W. Odlin

Here is an exceedingly odd and beguiling addition to any graphic program. It will demonstrate that what we call "speed-up" often has quite strange effects. To get the other effects, [BREAK] the program and type

60..... 017F
END... 02B4

The listing:

```
10 CLS:PRINT:PRINT:PRINT"   HERE
IS ONE MORE VERSION OF      POLYG
ON.   IT WILL DRAW A        FIGUR
E, AND THEN DO SOME ODD     THING
S TO IT.
20 PRINT:PRINT"   IF THE WAIT FOR
 THE "CHR$(34)"ODD          THINGS
"CHR$(34)" GROWS TOO BORING,
   PRESS "CHR$(34)"F."CHR$(34)
30 PRINT:PRINT"   PRESS ANY KEY T
O RESTART.
40 PRINT:PRINT:PRINT"   (PRESS =E
NTER= TO START)
50 IFINKEY$=CHR$(13)THEN60ELSE50
```

(Mr. Odlin is an Egyptologist and a swineherd.)

DEL'30 then [ENTER]. Now type *RUN*. Afterwards, to see the screen change again, delete Line 160 the same way. Finally, try SCREEN1,0 in Line 180 for another dramatic effect.

```
60 REM      POLYGON
            VAR. 17
70 PMODE4,1:PCLS:SCREEN1,1
80 PI=3.14159:M=RND(90)
90 FORT=0TO2*PI STEP PI/75
100 R=COS(M*T)*95
110 X1=COS(T)*R+128:Y1=SIN(T)*R+
96:A=T+PI/3:R2=COS(M*A)*95:X2=CO
S(A)*R2+128:Y2=SIN(A)*R2+96
120 IFINKEY$="F"THEN155
130 POKE65494,0:GOTO150
140 POKE65495,0
150 LINE(X1,Y1)-(X2,Y2),PSET:NEX
TT
155 REM
160 PMODE3:GOTO180
170 PMODE2
180 SCREEN1,1:POKE65314,248
190 IFINKEY$=""GOTO180ELSERUN60
```


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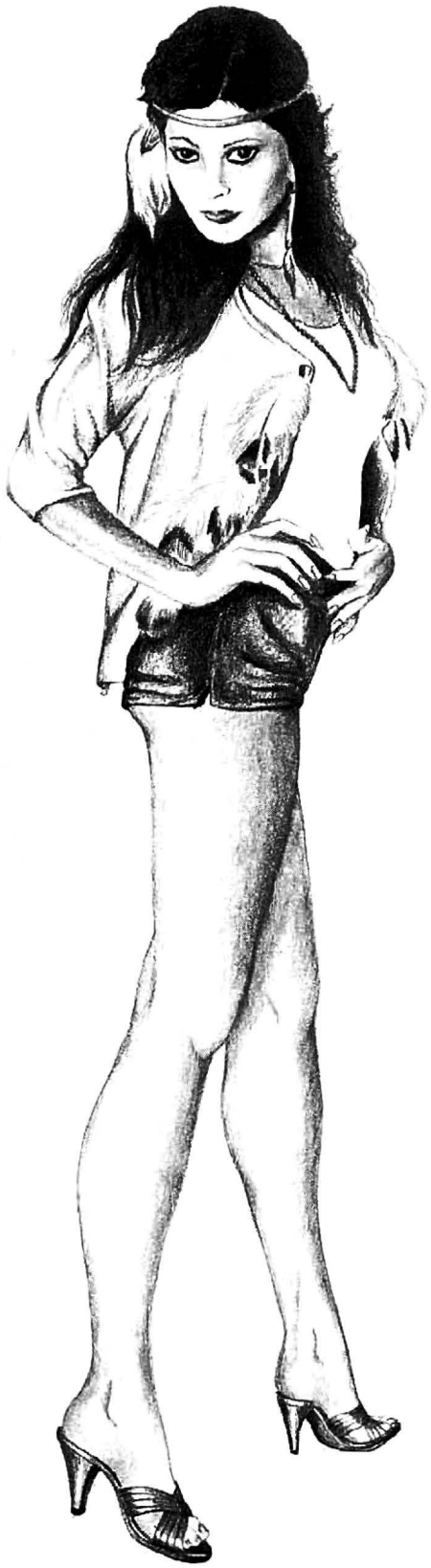
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RAINBOW Info

How To Read Rainbow

Please note that all the BASIC program listings you will find in *the Rainbow* are formatted for a 32-character screen — so they will show up just as they do on your CoCo screen. One easy way to check on the accuracy of your typing is to compare what character "goes under" what. If the characters match — and your line endings come out the same — you have a pretty good way of knowing that your typing is accurate.

We also have "key boxes" to show you the *minimum* system a program needs. But, *do* read the text before you start typing.

Finally, the little cassette symbol on listings indicates that program is available through our *Rainbow On Tape* service. An order form for this service is on the insert card bound in the magazine.

RAINBOW
CERTIFICATION
SEAL

The Rainbow Seal

The Rainbow Certification Seal is our way of helping you, the consumer. The purpose of the Seal is to certify to you that any product which carries the Seal has been physically seen by us and that it does, indeed, exist.

Manufacturers of products — hardware, software and firmware — are encouraged by us to submit their products to *the Rainbow* for certification. We ascertain that their products are, in actuality, what they purport to be and, upon such determination, award a Seal. This lets you know that we have seen the product and that it does, indeed, exist.

The Seal, however, is not a "guarantee of satisfaction." The certification process is different from the review process. You are encouraged to read our reviews to determine whether the product is right for your needs.

There is absolutely no relationship between advertising in *the Rainbow* and the certification process. Certification is open and available to any product pertaining to CoCo. A Seal will be awarded to *any* commercial product, regardless of whether the firm advertises or not.

We will appreciate knowing of instances of violation of Seal use.

Using Machine Language

Machine Language programs are one of the features of *the Rainbow*. There are a number of ways to "get" these programs into memory so that you can operate them.

The easiest way is by using an Editor-Assembler, a program you can purchase from a number of sources.

An editor-assembler allows you to enter mnemonics into your CoCo and then have the editor-assembler assemble them into specific instructions that are understood by the 6809 chip that controls your computer.

When you use an editor-assembler, all you have to do, essentially, is copy the relevant instructions from *the Rainbow's* listing into CoCo.

Another method of getting an assembly language listing into CoCo is called "hand assembly." As the name implies, you do the assembly by hand. This can *sometimes* cause problems when you have to set up an ORIGIN statement or an EQUATE. In short, you have to know something about assembly to hand assemble some programs.

Use the following program if you wish to hand assemble machine language listings:

```
10 CLEAR200,&H3F00:I=&H3F80
20 PRINT "ADDRESS:";HEX$(I);
30 INPUT "BYTE";B$
40 POKE I,VAL("&H"+B$)
50 I=I+1:GOTO 20
```

This program assumes you have a 16K CoCo. If you have 32K, change the &H3F00 in Line 10 to &H7F00.

What's A CoCo

CoCo is an affectionate name which was first given to the TRS-80 Color Computer by its many fans, users and owners. As such, it is almost a generic term for three computers, all of which are very much alike.

When we use the term CoCo, we refer to the TRS-80 Color Computer, the TDP System-100 Computer and the Dragon-32 Computer. It is easier than using the three "given" names throughout *the Rainbow*.

In most cases, when a specific computer is mentioned, the application is for that specific computer. However, since the TDP System-100 and TRS-80 Color are, for all purposes, the same computer in a different case, these terms are almost always interchangable.

The Rainbow Check

The small boxes which you see with programs in *the Rainbow* are our *RAINBOW CHECK* program, which is designed to help you type in programs accurately.

The check program will count the number of characters you type in. You can then compare the number the *RAINBOW CHECK* gives you to those printed in *the Rainbow*. On longer programs, some benchmark lines are given. When you reach the end of one of those lines with your typing, simply check to see if the numbers match.

To use the *RAINBOW CHECK*, type in the program, *CSAVE* it for future use, then type in the command *RUN* and press *ENTER*. Once the program has run, type *NEW* to remove it from that area into which you will be keying programs.

Now, whenever you press the down arrow, CoCo will give you the hexadecimal number of bytes in memory. This is to check against the numbers printed in *the Rainbow*. If your number is different, check the listing carefully to be sure you typed in the proper BASIC program code.

As the hexadecimal number appears in the upper-left corner of the monitor screen, you may want to clear the screen and press the spacebar five or six times to move the cursor out of the way for easy reading. The *RAINBOW CHECK* counts spaces, too, follow the spacing just as it appears in the magazine.

Here's the program:

```
 10 CLS:IF PEEK(116)=127 THEN
X=32688 ELSE X=16304
 20 CLEAR 25,X-1
 30 IF PEEK(116)=127 THEN X=32688
ELSE X=16304
 40 FOR Z=X TO X+77
 50 READ Y:W=W+Y:PRINT Z,Y;W
 60 POKE Z,Y:NEXT
 70 IF W=5718 THEN 80 ELSE PRINT
"DATA ERROR":STOP
 80 EXEC X:END
 90 DATA 182, 1, 106, 167, 141, 0, 68
 100 DATA 134, 126, 183, 1, 106, 190
 110 DATA 1, 107, 175, 141, 0, 57, 48
 120 DATA 141, 0, 4, 191, 1, 107, 57
 130 DATA 129, 10, 38, 44, 52, 22, 220
 140 DATA 27, 147, 25, 142, 4, 0, 141
 150 DATA 6, 31, 152, 141, 2, 32, 25
 160 DATA 52, 2, 68, 68, 68, 68
 170 DATA 141, 4, 53, 2, 132
 180 DATA 15, 129, 9, 46, 4, 139, 112
 190 DATA 32, 2, 139, 55, 167, 128, 57
 200 DATA 53,22,126,0,0
```

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HOT CoCo

COLOR COMPUTER MEMORY MAP

By BOB RUSSELL

This is the final installment in a comprehensive series of references on the Color Computer memory. First of all, I would like to thank all of you who offered compliments and suggestions. Your encouragement has been a primary motivational factor in continuing to update this map.

Next, what follows are the additional discoveries I have made during the last six months. Also included are corrections to any errors I made in version 1.0.

The complete version 2.0, however, will have its pages renumbered. Version 2.0 of the Memory Map will be available about the same time you read this article. It looks like the map will exceed 60 pages; it is 60 pages long at the time of this writing. The new version also contains many spelling corrections and a rewrite of some previous descriptions to try and clarify their functional descriptions. These changes *are not* included in this magazine version to save space.

Now for a few additional technical comments. Note that another reference has been added. I have begun to document changes between BASIC 1.2 and 1.1. Also, I have begun to document changes between Extended BASIC 1.1 and 1.0. Maybe I will find time in the next few months to improve the description of these changes also. I am not really sure what I am going to do with the new Disk BASIC because things have shifted so much. What are your suggestions?

If you prefer not to cut up your Rainbow *Magazine, you may purchase copies of Memory Map Version 2.0 in its entirety, enclosed in an attractive cover for $12 (American) postpaid. (Thanks for all the previous foreign orders, but the exchange rate has been bothersome to my small town bank.) Wisconsin residents should add 5% for sales tax. I also invite dealer and computer club volume purchases at discounted prices. For inquiries or placing orders, write: Bob Russell, N5474 Stillwater Court, Fredonia, WI 53021. Note the price had to go up to cover additional printing and mailing costs.*

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Sources referred to in this map:

1) *Getting Started With Color* BASIC
Copyright 1981 Tandy Corp.
Fort Worth,TX 76102

2) *Going Ahead With Extended* BASIC
Copyright 1981 Tandy Corp.
Fort Worth, TX 76102

3) *Service Manual, TRS-80 Color Computer*
Catalog Number 26-3001/3002

4) *TRS-80 Microcomputer News*
(for TRS-80 users)
P.O. Box 2910
Fort Worth, TX 76113-2910

5) *Color Computer News*
REMarkable Software
P.O. Box 1192
Muskegan, MI 49443

6) *the Rainbow*
9529 U.S. Highway 42
P.O. Box 209
Prospect, KY 40059

7) *80 Micro*
80 Pine Street
Peterborough, NH 03458

8) *Hot CoCo*
P.O. Box 975
Farmingdale, NY 11737

Beginning DEC ADDR	Beginning HEX ADDR	Ending DEC ADDR	Ending HEX ADDR	Description
00000	0000	32767	7FFF	RAM
00000	0000	01023	03FF	System Use
00006	0006			String flag indicating variable type. $00 = number $FF = string
00007	0007			Garbage Collection Flag $00 = not occured $FF = occured
00008	0008			Array assignment Flag $00 = assignment ok $FF = assignment not allowed Cleared from $AD43
00011	000B	00012	000C	Address of next available string descripter reset at $AD33
00041	0029	00042	002A	Continue line number displayed by execution of "STOP"
00043	002B	00044	002C	Temporary 2 byte storage area
00045	002D	00046	002E	Address of position to return to after execution of CONT.
00047	002F	00048	0030	Address of current Basic program line the interpreter is executing.
00049	0031	00050	0032	Current Data statement line number (after read)
00051	0033	00052	0034	Pointer to comma after last data value read
00055	0037	00056	0038	Name of last variable used
00104	0068	00105	0069	Current line number being interpreted. Will contain $FFFF if illegal line number or if in command mode
00106	006A	00111	006F	Parameters set by definition of the output device.
00106	006A			Comma field width (defaults to 16)
00107	006B			Tab field width (defaults to 16)
00109	006D			Number of characters in output line (if Device is set to 0 for screen this value is set to 32
00110	006E			Output device number
00112	0070			Input Buffer status flag 0=unpurged (something left) FF=purged (empty)

Beginning DEC ADDR	Beginning HEX ADDR	Ending DEC ADDR	Ending HEX ADDR	Description
00000	0000	32767	7FFF	RAM Cont.
00000	0000	01023	03FF	System Use Cont.
00120	0078			File mode set by OPEN or CLOSE statements 0 = closed 1 = open for input 2 = open for output
00121	0079			Dynamic changing count of characters remaining in the cassette Block as bytes are moved from the block to the Input/Output Buffer.
00122	007A	00123	007B	Address of the Input/Output Buffer.
00129	0081			CSRERR[2] 1 = Checksum Error (Tape Error) 2 = Memory Error (load error)
00135	0087			Last key pressed (character obtained by INKEY$)
00144	0090			Upper allowable pulse width limit. Default = $16 for cassette input.
00145	0091			Lower allowable pulse width limit. Default = $0A for cassette input.
00175	00AF			Trace Flag OFF = 0 = TRON ON = 79 = TROFF
00176	00B0	00177	00B1	Address of start of DEFUSR table. $013E
00189	00BD	00202	00CA	Line Data
00189	00BD	00190	00BE	X1 line starting X coordinate.
00191	00BF	00192	00C0	Y1 line starting Y coordinate.
00193	00C1			Current CSS mask for control of PIA register bits at $FF22. Value is either 0 or 8.
00194	00C2			Value is either 1 (indicating PSET or 0 indicating PRESET).
00195	00C3	00196	00C4	X2 line ending X coordinate.
00197	00C5	00198	00C6	Y2 line ending Y coordinate.
00199	00C7	00200	00C8	Previous line ending X coordinate.
00201	00C9	00202	00CA	Previous line ending Y coordinate.
00203	00CB	00218	00DA	Circle data
00203	00CB	00204	00CC	Center X coordinate.
00205	00CD	00206	00CE	Center Y coordinate.
00207	00CF	00208	00D0	Radius
00209	00D1	00210	00D2	H/W ratio
00217	00D9	00218	00DA	End point of a circle section
00219	00DB			Pixel Change flag
00222	00DE	00229	00E5	PLAY command data/constants
00222	00DE			Octave. "O" parameter-1. Default value is 2 or "O3".
00223	00DF	00224	00E0	Volume. "Vn" parameter.
00223	00DF			MSB of "V" (126+n*4). Default value is 186 or V15 (186=126+15*4)
00224	00E0			LSB of "V" (126-n*4). Default value is 66 or V15 (126-15*4).
00225	00E1			Note length "L". Default value is 4 or L4
00226	00E2			Tempo "T". Default value is 2 or T2. Must be value 0-255
00227	00E3			Number of Dots after note length. Default value is 0.
00281	0119	00282	0120	Address of next file buffer that could be allocated
00282	011A			Keyboard alpha lock (upper or lower case selection) [1] 0 = not locked (lower case) 255 = locked (upper case)
00318	013E	00337	0151	DEFUSR Table. Definition of entry point for USR functions 0-9
00318	013E	00319	013F	Address of DEFUSR 0
00320	0140	00321	0141	Address of DEFUSR 1
00322	0142	00323	0143	Address of DEFUSR 2
00324	0144	00325	0145	Address of DEFUSR 3
00326	0146	00327	0147	Address of DEFUSR 4
00328	0148	00329	0149	Address of DEFUSR 5
00330	014A	00331	014B	Address of DEFUSR 6
00332	014C	00333	014D	Address of DEFUSR 7
00334	014E	00335	014F	Address of DEFUSR 8
00336	0150	00337	0151	Address of DEFUSR 9
00336	0152	00345	0159	Keyboard rollover table [4] Oct 1981

	Bit 7	6	5	4	3	2	1	0	
00338 0152		ENTER	8	0	X	P	H	@	
00339 0153		CLEAR	9	1	Y	Q	I	A	
00340 0154		BREAK	:	2	Z	R	J	B	
00341 0155			;	3	~	S	K	C	~= UP ARROW
00342 0156			,	4	~	T	L	D	~= DN ARROW
00343 0157			-	5	~	U	M	E	~= LT ARROW
00344 0158			.	6	~	V	N	F	~= RT ARROW
00345 0159		SHIFT	/	7	~	W	O	G	~= BLANK
Dec val of contents of 338-345 if key in col. is pressed			191	223	239	247	251	253	254

```
  Beginning  Ending
  DEC   HEX  DEC   HEX
  ADDR  ADDR ADDR  ADDR                    Description
  ----- ---- ----- ----   ----------------------------------------
00000 0000 32767 7FFF    RAM Cont.

   00000 0000 01023 03FF     System Use Cont.

   00362 016A 00364 016C     Hook to keyboard input. Set to $7E8CF1 by
                             initialization of Extended Basic. Comes
                             here before input.

   00368 016D 00370 0172     Hook to make sure that a device is open for
                             output.

   00416 01A0 00418 01A2     Hook to allow Get and Put routines to access
                             disk records. Called from $8162,$6AFA,$975C,
                             $A910, and $C29A. Set to $7EC29A (JMP $C29A).

   00419 01A3 00421 01A5     Hook for Extended Basic interpreter
                             tokenization Called from $B821. Set to
                             $7E8304 (JMP $6304) by initialization of
                             Extended Basic.

   00422 01A6 00424 01A8     Hook for Extended Basic interpreter
                             untokenize. Called from $B7C2.

   00465 01D1 00488 01E6     File I/O data

      00474 01DA 00481 01E1     Filename found

      00482 01E2                File Type
                                0 = Tokenized Basic
                                1 = Data
                                2 = Binary

       00483 01E3 00484 01E4    File descripter block

          00483 01E3             0 = Data

          00484 01E4             0 = Tokenized Basic or assembly language
                                 <>0 = Ascii

       00487 01E7 00488 01E8    Start address or load address of an
                                assembly language program


01536 0600 06350 18CE    Disk buffers,variable storage, and DOS variable
                         storage (NOTE CONFLICT WITH GRAPHICS PAGES 1 - 4)
                         Buffer space normally defaults to 256 bytes at
                         startup but may be changed using the FILES command.
                         File control blocks (FCB's) default to 843 bytes
                         total at startup but can also be reset by the FILES
                         command. Req. FCB bytes = (FILES+1)*281.
                         Ref. [5] #9;[6] July 83 pp71-80

   01536 0600 01791 06FF     Disk buffer for Disk I/O - 1 sector long - 256
                             bytes are reserved at startup but may be changed
                             using FILES command.

   01792 0700 02047 07FF     Disk buffer for Disk I/O - 1 sector long - 256
                             bytes are reserved at startup but may be changed
                             using FILES command.

   02344 0928                Address of start of buffer table

   02380 094C                Disk filename storage area

   02391 0957 02392 0958     File type
                                $0000 Basic Program
                                $00FF Basic Program ASCII format
                                $0100 Binary Data
                                $01FF ASCII Data
                                $0200 Machine language program
                                $0300 Binary Text
                                $03FF ASCII Text

   02394 095A                Current Default drive number

   02395 095B                Number of user allocated file buffers

   02396 095C                Non 0 while doing DISKINI or BACKUP

   02397 095D                Non 0 while doing LOAD

01536 0600 06350 18CE    Disk buffers,variable storage, and DOS variable
                         storage (NOTE CONFLICT WITH GRAPHICS PAGES 1 - 4)
                         Buffer space normally defaults to 256 bytes at
                         startup but may be changed using the FILES command.
                         File control blocks (FCB's) default to 843 bytes
                         total at startup but can also be reset by the FILES
                         command. Req. FCB bytes = (FILES+1)*281.
                         Ref. [5] #9;[6] July 83 pp71-80

      02459 0987             Verify Status
                                1 for on
                                0 for off

   02978 0BA2 06350 18CE     Disk Buffers. For every file opened Disk
                                BASIC allocates a 281 byte buffer.

      02978 0BA2 03259 0CBB     1 file open.
      03260 0CBC 03540 0DD4     2 files open.
      03541 0DD5 03821 0EEB     3 files open.
      03822 0EEF 04102 1006     4 files open.
      04103 1007 04383 111F     5 files open.
      04384 1120 04664 1238     6 files open.
      04665 1239 04945 1351     7 files open.
      04946 1352 05226 146A     8 files open.
      05227 146B 05507 1583     9 files open.
      05508 1584 05788 169C     10 files open.
      05789 169D 06069 17B5     11 files open.
      06070 17B6 06350 18CE     12 files open.

  Beginning  Ending
  DEC   HEX  DEC   HEX
  ADDR  ADDR ADDR  ADDR                    Description
  ----- ---- ----- ----   ----------------------------------------
32768 8000 40959 9FFF    EXTENDED BASIC ROM [1]

   33467 82DE 33521 82F1     *S* Trace Routine Ref.[8]
```

```
   35056 88FD 35080 8908    *S* Extended BASIC's error processing routines
                                Ref. [5] #21 pl26-127

   35083 890B               Extended BASIC's error code table.

   35386 8A3A               *S* Entry to RENUM when all parameters are set

   36316 95AC               *S* Returns normal text screen from graphics

  Beginning  Ending
  DEC   HEX  DEC   HEX
  ADDR  ADDR ADDR  ADDR                  Description
  ----- ---- ----- ----  ----------------------------------------------
40960 A000 49151 BFFF    BASIC ROM[1]

   40974 A00E 41326 A170    Re-start routines. Ref.[5]#22

   40974 A00E 40998 A026    *S* Secondary restart routine enables the
                            cartridge interupt then determines whether cold
                            or warm start is specified. A warm start is
                            performed if the restart flag at $71 contains
                            $55 and if the the value of the byte pointed to
                            by the address at $72-73 is $12(NOP).

   40999 A027 41069 A06D    *S* Primary restart routine. Performs reset when
                            reset button is pressed. PIA and SAM are
                            reinitialized and then a jump to the secondary
                            reset routine $A00E is executed.
                            Function of reset button can be emulated in
                            software by POKE 113,0:EXEC 40999

   41076 A074 41191 A0E7    *S*Cold start routine

      41076 A074 41125 A0A5    Initializes low Ram Scratch pad memory
                               $0000-$3FFF, determines upper limit of RAM
                               and stores this limit at $74-$75, does
                               equivalent of CLEAR 200, and sets up BASIC's
                               next line pointer.

      41126 A0A6               Check for extended Disk ROM and branch:
                               Basic ends up here after Extended Basic
                               initializes and reconfigures the system to
                               include Extended Basic functions. Then a
                               check is made to see if Disk Basic ROM is
                               present: if $C000 contains $44 and $C001
                               contains $4B then jump is made to $C002

      41163 A0CB               Check for extended Basic ROM and branch:
                               a check is made to see if Extended Basic ROM
                               is present; if $8000 contains $45 and $8001
                               contains $58 then jump is made to $8002.

      41175 A0D7               *S* Displays version of BASIC ROM $A000-
                               $BFFF.

      41181 A0DD 41191 A0E7    *S* set restart vector and flag for warm re-
                               start go to main command mode idle loop

   41192 A0E8               *S* Warm restart (pointers not reinitialized)
```

```
41203 A0F3               *S* Return to BASIC

41206 A0F6               *S* Default FIRQ handler

41224 A108               *S* Cartridge secondary restart routine

40974 A00E 41328 A170    Re-start routines. Cont. Ref.[5]#22pp98-102

   41229 A10D 41256 A128    BASIC Initialization data down loaded to Ram
                            addresses $008F-$00AA.

   41257 A129 41286 A145    BASIC Initialization data down loaded to RAM
                            addresses $010C-$0129

   41286 A146 41328 A170    Copyright notice Logo text

41334 A176               *S* Get character from device specified by $6F and
                            put that character into REG. A. no modification

41393 A1B1 41410 A1C0    *S* Display cursor and wait for input character
                            from keyboard and put character into REG. A.

41409 A1C1 41414 A1C6    *S* Check for character at keyboard and flag status
                            (8 bit =0 if character is not there: 8 bit =1
                            if character is there). Ref. [5] Vol 1 #3

41416 A1C8 41452 A1EC    *S* Check for character at keyboard and decode
                            character. (called from $A1C3)

41453 A1ED 41516 A22C    *S* Decode character input from keyboard. (called
                            from $A1E1)

41517 A22D 41527 A237    *S* check for shift key depressed. (Called from
                            $A203)

41528 A238 41581 A26D    Check keyboard (called from $A21B)

41582 A26E 41601 A281    Keyboard Special character table
  41582 A26E                $5E (Up Arrow) = 94
  41583 A26F                $5F (Shift Up Arrow) = 95
  41584 A270                $0A (Down Arrow) = 10
  41585 A271                $5B (Shift Down Arrow) = 91
  41586 A272                $08 (Left Arrow) = 8
  41587 A273                $15 (Shift Left Arrow) = 21
  41588 A274                $09 (Right Arrow) = 9
  41589 A275                $5D (Shift Right Arrow) = 93
  41590 A276                $20 (Space) = 32
  41591 A277                $20 (Space) = 32
  41592 A278                $30 (Zero) = 48
  41593 A279                $12 (Shift Zero) = 18
  41594 A27A                $0D (Enter) = 13
  41595 A27B                $0D (Shift Enter) = 13
  41596 A27C                $0C (Clear) = 12
  41597 A27D                $5C (Shift Clear) = 92
  41598 A27E                $03 (Break) = 3
  41599 A27F                $03 (Shift Break) = 3
  41600 A280                $40 (@)          64?
  41601 A281                $13 (Shift @)    19?

41602 A282 41639 A2A7    *S* Character output routine determines current
                            output device specified by $6F, then outputs
                            the character in reg A to that device.
```

Beginning DEC ADDR	Beginning HEX ADDR	Ending DEC ADDR	Ending HEX ADDR	Description
40960	A000	49151	BFFF	BASIC ROM[1] Cont.
41640	A2A8	41682	A2BE	Set parameters $79-$7E and perform cassette output
41686	A2BE	41722	A2FA	*S* Send character in REG. A. to current output device. Called as subroutine from $A282. Ref. [5] Vol 1 #4 and [6] Vol 2 #8 p122-123
41723	A2FB	41737	A309	*S* Send bit (called from $A2DD)
41730	A302			*S* Delay half bit time
41738	A30A	41822	A35E	*S* Screen Display routine. Ref.[6] April 83 p50
41823	A35F	41859	A383	*S* Routine to set output parameters for selected device in RAM memory $6A to $6F
41860	A384	41868	A38C	*S* Routine to set up parameters for cassette output
41869	A38D	41964	A3EC	*S* Subroutine clears sceen then does line input to buffer.
41872	A390			*S* Line input entry point (no clear screen)
41965	A3ED	41989	A405	*S* Routine to assure proper file mode is set and file has properly been opened
41990	A406	42005	A415	*S* Routine to assure when device is set for cassette output that a file is open for output and the mode is correct
42006	A416	42044	A43C	*S* Execution of "CLOSE" BASIC command (Token $9A)
42045	A43D	42059	A44B	*S* Assure any remaining characters in the output buffer are purged from the buffer and written to the output device (called by Close from $A43B)
42060	A44C	42135	A497	*S* Execution of "CSAVE" BASIC command (Token $98)
42136	A498	42237	A4FD	*S* Execution of "CLOAD" BASIC command (Token $97)
42232	A4F8			*S* Display of "I/O Error"
42238	A4FE	42301	A53D	*S* Execution of "CLOADM" Called by CLOAD Command from $A49C
42302	A53E	42323	A553	*S* Execution of "EXEC" BASIC command (Token $A2)
42324	A554	42339	A563	Position cursor for PRINT@
42340	A564	42359	A577	*S* Execution of "INKEY$" BASIC function (Token $FF92)
42360	A578	42401	A5A1	*S* Parse out filename from current position in input buffer. Used in conjunction with search for filename routine at $A648
42394	A59A	42401	A5A1	*S* Transfer block X register holds starting address, B register holds number of bytes to move, U holds destination address.
42402	A5A2	42436	A5C4	*S* Parse out device number
42437	A5C5	42445	A5CD	*S* Parse out filename called by CLOAD from $A4A6 and by SKIPF from $A5EC
42446	A5CE	42475	A5EB	*S* Execution of "EOF" Basic function (Token $FFEC)
42476	A5EC	42485	A5F5	*S* Execution of "SKIPF" command (Token $A3)
42486	A5F6	42531	A623	*S* Execution of "OPEN" command (Token $99)
42532	A624	42567	A647	*S* Open a tape file for input
42549	A635			*S* Read an ASCII file from tape
42568	A648	42583	A657	*S* Search tape for a filename
42584	A658	42624	A680	*S* Open a tape file for output
42625	A681	42702	A70A	*S* Find a file specified by filename $1D2 - $1D9
42750	A6FE	42762	A70A	*S* Blink Corner of the screen
42825	A749	42836	A754	*S* Read one byte
42837	A755	42844	A75C	*S* Read one bit
42845	A75D	42859	A76B	Determine wavelength of cassette input
42860	A76C	42875	A77B	Time cassette input by watching for 0 crossover
42876	A77C	42902	A796	*S* Turn on tape motor synchronize data (read gap/$55's); U and Y are preserved: FIRQ and IRQ are masked
42903	A797	42924	A7AC	Calculate Time Till next falling edge. Called from $A786
42925	A7AD	42937	A7B9	Check that pulse width is between allowable limits. Called from $A784
42938	A7BA	42940	A7BC	Clear pulse counter. Called from $A7B5.
42941	A7BD	42967	A7D7	*S* Execution of "MOTOR" command (Token $9F)
42954	A7CA			*S* Turn on tape motor
42961	A7D1	42967	A7D7	*S* 500 millisecond delay
42963	A7D3	42967	A7D7	*S* Entry point to the delay routine where you can set the delay by the magnitude of a value you pass in the X register. An RTS will be processed when countdown to 0 is reached.
42968	A7D8	42980	A7E4	*S* Turn on tape motor and write leader/gap/$55's

```
42981 A7E5 42995 A7F3    *S* Write one record to tape with motor control

   42985 A7E9 42995 A7F3    *S* Turn off tape motor

42996 A7F4 43046 A826    *S* Write Block: tape should be up to speed and
                             leader of $55's already written in 1st block:
                             $7E contains the buffer address; $7C contains
                             the block type; $7D contains number of data
                             bytes in block; X= buffer address + number of
                             data bytes; all registers modified

43050 A82A               *S* Write one byte. Called by Write Block Routine
                             from $A80F,$A813,$A817,$A81E

   43100 A85C               Sine table for CSAVE.
                                 Hex    Decimal
      43100 A85C                 $82      130
      43101 A85D                 $92      146
      43102 A85E                 $AA      170
      43103 A85F                 $BA      186
      43104 A860                 $CA      202
      43105 A861                 $DA      218
      43106 A862                 $EA      234
      43107 A863                 $F2      242
      43108 A864                 $FA      250
      43109 A865                 $FA      250
      43110 A866                 $FA      250
      43111 A867                 $F2      242
      43112 A868                 $EA      234
      43113 A869                 $DA      218
      43114 A86A                 $CA      202
      43115 A86B                 $BA      186
      43116 A86C                 $AA      170
      43117 A86D                 $92      146
      43118 A86E                 $7A      122
      43119 A86F                 $6A      106
      43120 A870                 $52       82
      43121 A871                 $42       66
      43122 A872                 $32       50
      43123 A873                 $22       34
      43124 A874                 $12       18
      43125 A875                 $0A       10
      43126 A876                 $02        2
      43127 A877                 $02        2
      43128 A878                 $02        2
      43129 A879                 $0A       10
      43130 A87A                 $12       18
      43131 A87B                 $22       10
      43132 A87C                 $32       50
      43133 A87D                 $42       66
      43134 A87E                 $52       82

   43951 ABAF            BASIC Error Code Table

   44001 ABE1 44007 ABE7 ASCII text 'ERROR'

   44008 ABE8 44011 ABEB ASCII text 'IN'

44064 AC20               *S* Routine to move a block of memory: $41-$42
                             holds destination top address; $43-$44 holds
                             source top address; $45-$46 holds destination
                             bottom address; $47-$48 holds source bottom
                             address.

44102 AC46 44146 AC72    *S* Error Processing routine. Ref. [5] #21 p126-127
```

```
44030 AC37               *S* Check if room under stack.

44156 AC7C               *S* Tokenize ASCII inputs

44271 ACEF               *S* Execution of a routine that relinks line link
                             pointers (The first 2 bytes in a line point
                             to the address of the start of the next line.)

   44321 AD21               *S* Execution from this point clears all
                                variables and moves the stack

   44326 AD26               *S* Execution from this point clears variables
                                only

44510 ADE4 44522 ADEA *S* Execution of "RESTORE" BASIC command
                          (Token $8F) Ref. [5] #21 p 126-127

44539 ADFB               *S* Exec 44539 has performs equivalent of :
                             1 A$=INKEY$:IFA$=""THEN1

44903 AF67               *S* Get next line number and place it in temporary
                             scratch area $2B-2C

45677 B26D               Check for "," syntax

45679 B26F               Check for "A" syntax

46052 B3E4               Put cursor position in D register (called by
                         PRINT@ routine from $B3E4

46154 B44A               *S* Display of "FC ERROR" message.

46859 B70B               *S* Execution of routine to evaluate argument of
                             PCLEAR command. Argument should be present in B
                             register.

46909 B73D               Determine offset load value for CLOADM command

49152 C000 65279 FEFF    Cartridge ROM[1]/ Disk Operating System (DOS ends at
                          $D800)

   49665 C201 49683 C213    Disk BASIC Function keyword - token table - ASCII
                            Characters

                                CONTAINS    CONVERTED TO TOKEN
                                STRING        HEX  DEC(MSB) DEC(LSB)
      49665 C201 49667 C203      CVN          $FFA2   255       162
      49668 C204 49671 C207      FREE         $FFA3   255       163
      49672 C208 49674 C20A      LOC          $FFA4   255       164
      49675 C20B 49677 C20D      LOF          $FFA5   255       165
      49678 C20E 49681 C211      MKN$         $FFA6   255       166
      49682 C212 49683 C213      AS           $FFA7   255       167
                                 (Note that AS is tokenized but is not in the
                                  table of pointers $C214-C21D.

   49684 C214 49693 C21D    Table of Pointers to subroutine entry addresses
                            associated with Disk BASIC Function Keyword Table
                            defined at $C201 to $C213

                               Contents  For Function
      49684 C214                $CD1A     CVN
      49686 C216                $CDC0     FREE
      49688 C218                $CD36     LOC
      49690 C21A                $CD5B     LOF
      49692 C21C                $CD28     MKN$
```

```
49741 C24D 49783 C277    *S* Disk BASIC's error processing routine. Ref.[5]
                             #21 p127-128

49784 C278               Disk BASIC's error code table.

Beginning  Ending
DEC   HEX  DEC   HEX
ADDR  ADDR ADDR  ADDR              Description
----- ---- ----- ----  ----------------------------------------
49152 C000 65279 FEEF    Cartridge ROM[1]/ Disk Operating System (DOS ends at
                           $D800)

  50280 C468          *S* OPEN file subroutine. Before calling this
                      routine the filename should be processed by the
                      routine at $C8A4, the A reg should contain the
                      file mode ($49=ASCII "I" for input or $4F=ASCII "O"
                      for output), the B reg should contain the device
                      number. Also $957-958 should contain the file type.

  50882 C6C2          *S* Execution of "KILL" Disk BASIC command
                          (Token $D2)
     50885 C6C5         *S* Entry point for KILL when you have set
                        the filename  you want to kill by executing
                        the routine at C84A.

  51364 C8A4          *S* Subroutine to process a filename.  Prior to
                      calling this routine $EB should be set with the
                      default drive number, and $957 should contain the
                      filename.

  51771 CA3B          *S* performs close of a disk file

  51795 CA53          *S* entry point for close when Device #
                        at $6F is set.

  52876 CE8C          *S* Execution of "SAVEM" Disk BASIC command
                          (tokenized to $D84D Note $4D is the letter
                          "M")

  52965 CEE5          *S* Execution of "LOADM" Disk BASIC command
                          (tokenized to $D34D Note $4D is the letter
                          "M")

     53733 D1E5 53774 D20E *S* Cleanup after BACKUP, DSKINI, or LOAD command
                           Ref. [5] #21 p126-127

Beginning  Ending
DEC   HEX  DEC   HEX
ADDR  ADDR ADDR  ADDR              Description
----- ---- ----- ----  ----------------------------------------
65280 FF00 65535 FFFF    INPUT/OUTPUT AREA[3]

65376 FF60 65378 FF62    Control registers for special I/O (used for Radio
                         Shack Digitizer 26-1195

  65376 FF60               X coordinate 0-255

  65377 FF61               Y coordinate 0-191

  65378 FF62               Pen Status

                             Bit 0 = Pen down
                             Bit 1 = Proximity (pen is within writing range
                                     of digitizer
                             Bit 2 = X margin
                             Bit 3 = Y margin
```

```
Beginning  Ending
DEC   HEX  DEC   HEX
ADDR  ADDR ADDR  ADDR              Description
----- ---- ----- ----  ----------------------------------------
65280 FF00 65535 FFFF    INPUT/OUTPUT AREA[3]
                         Map of areas that have changed between Basic 1.2
                         and 1.1
40961 A001               New start address for keyboard poll routine - POLCAT

41236 A114               Change to Basic initialization value of default baud
                         rate.

41321 A155               Change to copyright notice to replace 0 in 1.0 by 1
                         to obtain 1.1
41310 A15E               Change to year of copyright notice from 0 in 1980 to
                         3 in 1983.

41398 A1B6               New address for keyboard strobe routine.

41409 A1C1 41490 A212    Changes to POLCAT
41494 A21C                       "
41501 A21D                       "
41505 A221                       "
41517 A22D                       "
41524 A234 41581 A26D            "

41667 A2C3 41722 A2FA    Changes to RS-232 Output Byte routine.

42346 A56A               Change to INKEY$ routine.
44541 ADFD                       "

45631 B23F                ?

45966 B38E                ?

46061 B3ED 46118 B426     Changes to INTCNV routine

47574 B9D6                Mod to floating point add.

Beginning  Ending
DEC   HEX  DEC   HEX
ADDR  ADDR ADDR  ADDR              Description
----- ---- ----- ----  ----------------------------------------
                         Map of areas that have changed between Extended
                         Basic 1.1 and 1.0

32976 80D0 32989 80DD

33023 80FF

33042 8112

34555 86FB

35867 8C1B 35874 8C22    Apparent fix to DLOAD command

35921 8C51                       "

37241 9179

37245 917D

38444 962C 38445 962D     Fix to PMODE command.

38563 96A3 38579 96B3     Fixes to PCLEAR command to eliminate ?SN error when
                          executing PCLEAR in start of a program.
```

RECEIVED & CERTIFIED

The following products have been recently received by *the Rainbow*, examined by our magazine staff and approved for the *Rainbow Seal of Certification*, your assurance that we have seen the product and have ascertained that it is what it purports to be.

This month the *Seal of Certification* has been issued to:

Air Traffic Controller, a 32K ECB computer model of an air traffic control situation. Remotely piloted vehicles are operated by the controller in a situation similar to that of a commercial airline in that you must regulate landings and takeoffs of the vehicles. Tom Mix Software, 3424 College N.E., Grand Rapids, MI 49505, tape $28.95

Buzzard Bait, a 32K ML game for one or two players. Objective: You are the bird and must fly with your joust, destroying enemies and capturing eggs of the enemy birds. Tom Mix Software, 3424 College N.E., Grand Rapids, MI 49505, tape $27.95

Grabber, a 32K ML game for one or two players. Objective: You are the Grabber and must grab the eight treasures and store them in the center boxes. Tom Mix Software, 3424 College N.E., Grand Rapids, MI 49505, tape $27.95

Devil Assault, a 16K ECB multi-level game with each level getting progressively more difficult. Objective: Defend your base from attacking bird-like creatures who eventually turn into the Devil and are out to destroy you. Tom Mix Software, 3424 College N.E., Grand Rapids, MI 49505, tape $27.95

Cuber, CU * BER, a 32K ML arcade-type game. Objective: Help Cuber change the colors of the pyramid while avoiding the dangers of Vipers, the Nurd, and the Dork. Tom Mix Software, 3424 College N.E., Grand Rapids, MI 49505, tape $27.95

Journey To Mount Doom, a 32K ML adventure type game. Objective: You must find and destroy the Nercromancer's lost gold ring, and discover the way to Mt. Doom before war is waged on the earth. Tom Mix Software, 3424 College N.E., Grand Rapids, MI 49505, disk $27.95

Junior's Revenge, a 32K arcade-type game. Objective: Climb vines, avoid obstacles and creatures to save your father from the zoo-keeper. Computerware, P.O. Box 668, Dept. B2, Encinitas, CA 92924, tape $28.95

HyperZone, a 32K space game with nine skill levels. Objective: Fire torpedoes and shield your ship from the swarm of enemy ships in a deep space battle. Computerware, Box 668, Dept. B2, Encinitas, CA 92024, tape $26.95

Time Patrol, a 32K World War IV game in 2283. Objective: Fire machine guns and try to shoot down enemy planes while avoiding their bombs. Computerware, Box 668, Dept. B2, Encinitas, CA 92024, tape $26.95

The Sourcerer, a 16K program producing symbolic source code that can be assembled. It disassembles to disk, tape, printer, or screen. Position independent code and user defined symbol/label buffer area. Four formats: hex dump, ASCII dump, full listing and symbolic mode. Computerware, P.O. Box 668, Dept. B2, Encinitas, CA 92024, tape $34.95

The Color BASIC Compiler, a 32K program that allows you to write your own program in easy BASIC, then converts into machine language and will make your program run an average of 42 times faster. Includes a 27 page instruction manual. Computerware, Box 668, Dept. B2, Encinitas, CA 92024, disk $39.95

Dragon Cruncher. a cassette-based, menu-driven program that converts most Dragon 32 programs for use on the Tandy Color Computer and converts most Tandy Color Computer programs for use on the Dragon 32. Elkan Electronics, Freepost, 11 Burg New Road, Prestwich, Manchester M25 6LZ, tape $7.95

Microcom, a ML telecommunications in 6803 code which will enable the MC-10, with data-base services, B.B.S.'s and other host computers. This program has a memory-seeking function which automatically ex pands the buffer according to available memory area. The buffer may be opened and closed by the user while on-line for more selective use of memory. *Microcom* will also allow the user to scan the buffer and to dump information from the buffer to a printer. Micro Ten Software, 496 Amboy Avenue, Perth Amboy, NJ 08861, tape $19.95

TV Graphics Editor, a 16K program written to help create, modify, and correct graphics pictures in the same way that a text editor operates on the printed word. The basic principle behind the operation of this editor is the use of the joysticks for cursor control, and the use of the keyboard to control the editing functions, in conjunction with these cursors. International Software, 820 Dunsmuir Rd., Victoria, B.C., Canada, V9A 5B7, tape $27.95 - Canadian or $22.95 U.S.

Screen Two, a 16/32K program that provides enhancement of the CoCo's limited alphanumerics screen by automatically printing the letters in PMODE 4 and allowing a variety of print options and formats. International Software, 820 Dunsmuir Rd., Victoria, B.C., Canada, V9A 5B7, tape $14.95 - Canadian or $12.50 U.S.

Learning Games: Shapes, Words, and Counting, three 16K ECB educational programs designed for children in pre-school through elementary grades to help learn shapes, words and counting. DD Software, 10 Simonne Lane, Pepperell, MA 01463, tape $24.95

Disk Manager, a 16K menu-driven program that allows you to copy disk files from one disk to another, or from disk to cassette. Elite Software, Box 11224, Pittsburgh, PA 15238, disk $24.95

Programmers Worksheet, a worksheet designed to become the front page of your new program to help save time and to remember variable assignments, descriptions, subroutine locations, etc. CoCo Data Enterprises, 1316 Quail Avenue, McAllen, TX 78504, $1.50

Tutorcode, a 16K program that teaches International Morse Code to beginners and increases speed proficiency from 3 w.p.m. to 25 w.p.m. Rabbitt Ware, Inc., Rt. 1, Bascome Road, Jackson, TN 38305, tape $19.95

Early Games For Young Children, nine 16K educational games for children ages 2½ to 6. No adult supervision is required. The Picture Menu gives the children control. They can: match numbers, count colorful blocks, add and subtract stacks of blocks, draw and save colorful pictures, match letters, learn the alphabet, spell their names, and compare shapes. Counterpoint Software, Inc., 4005 W. Sixty-Fifth Street, Minneapolis, MN 55435, disk $29.95

Battery Back-Up, a battery back-up system for 32K/64K of memory without changes to your CoCo. Circuitry is contained in ROM-port cartridge with an on-off switch on cartridge, with LED indicator. Provides over two hours support time during power failures. Includes rechargeable battery. SAV-A-BYTE, 2857 Emanual Church Road, W. Columbia, SC 29169, $89 or $99 with bus extender option.

Holiday Script, a 16K ECB script writing program with upper and lowercase lettering and punctuation. Tampa Instructional Center, 201 East Linebaugh Avenue, Tampa, FL 33612, tape $8.95

Holiday Carolers, a 16K ECB program that draws a video display of Christmas Carolers. Tampa Instructional Center, 201 East Linebaugh Avenue, Tampa, FL 33612, tape $5.95

Holiday Jamboree, five 16K ECB programs each of which include: *Holiday, Village, Angel, Holly* and *Santa.* Tampa Instructional Center, 201 East Linebaugh Avenue, Tampa, FL 33612, tape $7.95

DEFT Colour Software Workbench, a 32K ECB complete set of software development tools designed to support a programmer through the process of creating computer programs from the entering of source code, through the execution of the resulting machine program. *The Colour Software Workbench* is comprised of the following software packages: *Colour Text Editor, Colour Pascal Compiler, 6809 Macro Assembler, Colour Linker, Symbolic On-Line Debugger,* and *Colour Software Run Time Library.* The first five packages are used to develop programs, whereas the sixth is used to enhance those programs developed with the *Colour Software Workbench.* Includes a 200-page User's Guide with language references. DEFT Systems, Inc., P.O. Box 359, 6 Faith Court, Demacus, MD, 20872, disk $150

Body Parts, a 16K ML adult party game. Objective: See if the computer can guess the body part you have in mind. The program learns and responds with questions. Elite Software, Box 11224, Pittsburgh, PA 15238, tape $17.95

Panic Button, a 16K ML game with three skill levels. Objective: The boss wants an order filled, like yesterday! Keep up with the conveyer belt, hit the panic button to stop the assembly line while the clock's ticking, complete the order in time and you get to sock the boss, otherwise you are fired. First Star Software, Inc., 22 East 41st Street, New York, New York 10017, tape $24.95

Estimate, a 16K ECB program designed to help children to practice estimating the answers to addition, subtraction, multiplication and division problems in five skill levels for up to five students and is user modifiable. Tom Mix Software, 3424 College N.E., Grand Rapids, MI 49505, tape $19.95

Planet Conquest, a 16K game with six skill levels. Objective: Score points by destroying monsters and landing your ship on level ground with your ship perfectly upright while avoiding running out of fuel and keeping gravity in control. International Software, Inc., 820 Dunsmuir Road, Victoria, B.C., Canada, V9A, 5B7 tape $19.95 or U.S. $16.50

Mr./Ms. CoCo Head, a 16K ECB program for ages 3-10 that will create a variety of faces by changing different types of eyes, noses, ears, mouths, hair, etc. Computer Island, 227 Hampton Green, Staten Island, NY 10312, tape $15.95

The Great Hamster Hunt, a 32K ECB adventure game for ages 3-10. Objective: Search objects and furniture in every room until you find the hamster. Each room is represented by a familiar object. Computer Island, 227 Hampton Green, Staten Island, NY 10312, tape $19.95

Factors Tutor, a 16K ECB program that will help teach the skill of factoring in four skill levels that teaches factors, prime numbers and G.C.F. HELP command is available at each step. Computer Island, 227 Hampton Green, Staten Island, NY 10312, tape $19.95

Graph It, a 16K ECB program that allows the user to graph algebraic equations including linear, quadratic higher order equations. Multiple and systems of equations can be graphed simultaneously. Computer Island, 227 Hampton Green, Staten Island, NY 10312, tape $14.95

Horse Race, a 16K ECB game for 1-6 players. Objective: Race your horses and beat the odds. Computer Island, 227 Hampton Green, Staten Island, NY 10312, tape $11.95

Know Your States, a 32K ECB program with a Hi-Res graphic portrayal of each state for the user to identify. Computer Island, 227 Hampton Green, Staten Island, NY 10312, tape $19.95

Adventure Starter, two 16K ECB adventure programs designed for the beginner adventurer. *My house,* a relatively simple adventure that is not filled with death traps and the HELP command is used extensively. *Pirates,* a harder adventure than the first. The user should be ready to accomplish the most difficult adventures after completing this program. Owls Nest Software, P.O. Box 579, Ooltewah, TN 37363, tape $17.95

Foodwar, a 32K arcade game. Objective: Eat the ice cream cone before it melts away while avoiding holes, and the chef. Arcade Animation, Inc., 21 The Fairway, Upper Montclair, NJ 07043, disk $27.95

Ice Master, a 32K arcade game. Objective: Crush mosquitoes with sliding blocks of ice and avoid getting stung. Arcade Animation, Inc., 21 The Fairway, Upper Montclair, NJ 07043, disk $26.95

Color Tutor, a 16K ECB program for language, history, math and vocabulary drills. Enter questions and answers, the program randomizes and presents the questions and keeps the lesson score. Elite Software, Box 11224, Pittsburgh, PA 15238, tape $19.95

Loan Payment Calculator, a 16K ECB program that will calculate what a monthly loan payment will be. Amount of loan, interest rate, and length of loan are displayed and any item can be changed to determine monthly payments. Output to a printer if desired. Elite Software, Box 11224, Pittsburgh, PA 15238, tape $19.95

Game Package 2, fourteen 16K ECB games for use with a joystick including: *Alien Defense, Starship, MX Missile, Peace Keeper, Hangman, Slide, One Armed Bandit, Life, Pukeman, Messenger, Meteor Destroyer, CoCo Hello, Lander, Spike & Mastermind.* Dragonfly Software, 12503 Davan, Colesville, MD 20304, tape $16

The Spectrum Speaker, a voice-pak/voice sythesizer with features such as: an unlimited vocabulary; automatic inflection; Votrax SC01 phoneme synthesizer; four programmable pitch levels; a single line in BASIC produces a full sentence; voice editor which creates an unlimited number of words, sound effects, etc. Comes with a user's manual, software cassette and is fully assembled & tested. Spectrum Projects, 93-15 86th Drive, Woodhaven, NY 11421 ROMpack $69.95

Cash Budget Management, a 16K ECB program that is a personal bookkeeping and budgeting system. By entering your actual income and expense amounts on a regular periodic basis, you can keep track of exactly where you spend your money for up to 12 months. And by comparing actual with budgeted amounts, you can see how well you're staying within your budget. Choice of ten income categories, 86 expense categories, and three cash accounts, or you may define your own budget categories. Also, prints data for immediate use and save information on disk for storage purposes. Radio Shack Stores nationwide, disk $49.95

Peanut Butter Panic, an ECB cooperation/-strategy game for two players, ages seven and up in which success depends on cooperation. Objective: As players jump for stars to make peanut butter sandwiches, they soon find that they must work together to catch the most valuable stars, and must watch their weight and share the sandwiches they make. Teamwork develops naturally and is well rewarded. Radio Shack Stores nationwide, tape $19.95

Cashman, a 32K game with over 40 different screens for one or two players. Objective: Collect all the bags of gold on each screen, represented by pulsating dollar signs. Computer Shack, 1691 Eason, Pontiac, MI 48054, disk $29.95

Euchre, a 32K ECB Hi-Res version of the card game. Objective: Achieve the best possible card hand and be first to knock or trump. Chroma Systems Group, P.O. Box 366, Dayton, OH 45420, disk $19.95

Dskmon, a 16/32K multi-purpose disk utility that examines and fixes sector data, also includes disk read, write, file information display, and selective disk backup. Chroma Systems Group, P.O. Box 366, Dayton, OH 45420, disk $24.95

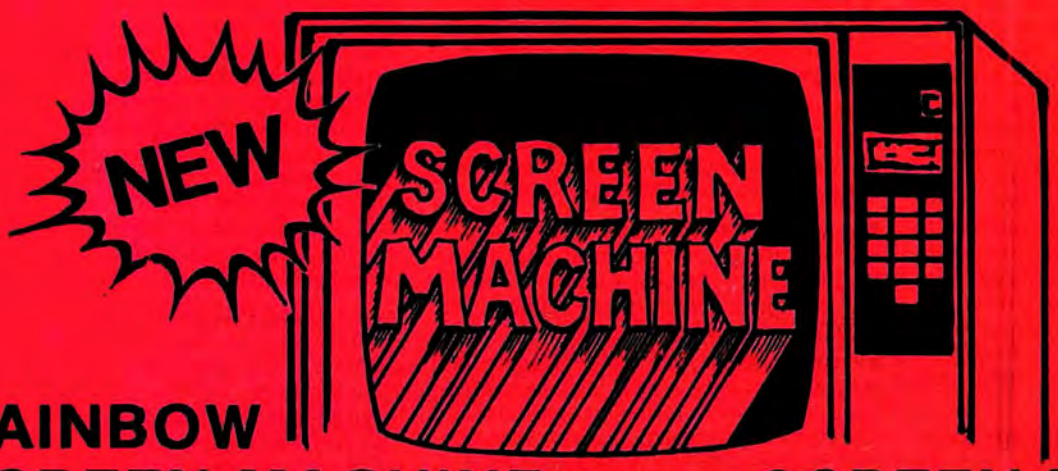
Catalyst, a 16K game for one or two players. Objective: Move your atom within the reaction area. Create a new form by first capturing free hydrogen atoms and then free carbon atoms. Once you have captured the right amount, destroy the catalyst and complete the mutation. Computer Shack, 1691 Eason, Pontiac, MI 48054, disk $21.95, tape $19.95

Super Flash Cards, a 16K ECB educational math program that gives the player practice or drill on any set of basic math facts. Moreton Bay Software, 316 Castillo Street, Santa Barbara, CA 93101, tape $15.95

Chopper Strike, a 16/32K game. Objective: Pilot your chopper through a deadly, never ending obstacle course, avoiding gun turrets, short range rockets, oil tanks, and ICBMs. Computer Shack, 1691 Eason, Pontiac, MI 48054, disk $29.95

Color Demon Seed, a 32K space game. Objective: Take on and destroy each successive wave of demons while moving at all times and being ready to use your shield. Computer Shack, 1691 Eason, Pontiac, MI 48054, disk $29.95 tape $27.95

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More Beef, two 32K ECB programs both of which use the techniques of linear programming to calculate the least cost, nutritionally adequate feed rations for beef cattle. This program uses either the metric measurements or American measurements of pounds, bushels and bales to calculate the feed rations. **More Beef** features include: searches among up to ten different feeds to calculate the nutritionally adequate feed rations and allow you to change the prices for each of the ten feeds; changes the nutritional composition of each feed to suit the conditions in your geographical area; each feed ration is tested for deficiencies in calcium, phosphorus, and vitamin A; will calculate feed rations for ten categories of cattle (steers by weight heifers by weight, lactating cows, pregnant cows, etc.) The output is printed on screen or line printer. Feed rations are reported by head for the entire herd. Moreton Bay Software, 316 Castillo Street, Santa Barbara, CA 93101, tape $49.95

Cookie Monster's Letter Crunch, an ECB educational game of basic skills for ages 3-6. Objective: Help Cookie Monster bake cookies by matching words and letters. Radio Shack Stores nationwide, tape $19.95

The Color Accountant, a menu-driven financial management program that consists of ten programs, each of which perform separate functions which include: recording checks and deposits; balancing checkbooks; recording savings, loans, and investments; prints checks; budgets spending and savings; graphs financial information; keeps track of bills and appointments; and prints mailing lists. Includes a 145-page user's manual. Programmer's Institute, P.O. Box 3470, Chapel Hill, NC 27514, disk $79.95

Homebase, a 32K database management, word processing and spread sheet calculations program in one integrated package that is a tool for developing your own computer applications, without programming or having to use several different software packages. Includes two master diskettes, an instruction manual detailing each option and command, and a demonstration diskette with tutorial. Homebase Computer Systems, P.O. Box 3448, Durham, NC 27702, disk $75

Dyfin, a 16K ECB menu-driven program designed to aid in the financial planning of loans, savings, annuities, investments and retirements. Also included is a 500-year calendar, plus a checkbook program. Dynamic Electronics, Inc., P.O. Box 896, Hartselle, AL 35640, tape $19.95

Context Clues, 16K ECB reading program containing 50 situational paragraphs with one key word missing. Child can use context clues to find the correct answer in a multiple choice format. Available for grades 4-7. Computer Island, 227 Hampton Green Staten Island, NY 10312, tape $17.95

Fembot's Revenge, a 32K, 3-D graphic adventure game. Objective: You have escaped the slave ship in Beyond the Cimeon Moon, and have taken the quest to return to the Mother Ship to destroy the Guardians, free your fellows, and return control of your civilization to sentient beings. Color Quest, A Division of Softlaw Corporation, 9072 Lyndale Avenue, So., Minneapolis, MN 55420, disk $34.95

Taxi, an ECB cooperative/strategy game for ages seven and older. Objective: Drive the taxi by maneuvering around street grids based on city maps and try to deliver as many passengers as possible before the time is up. When played cooperatively, the game encourages communication and division of labor. Radio Shack Stores nationwide, tape $19.95

Investment Analysis, a 4K package of three separate programs on two cassettes for the TRS-80 PC-2 which includes: *The Fixed Income Security Evaluator,* a program that calculates information useful when buying or selling fixed income securites; *The Commission Calculator,* a program that figures commissions for stock and option transactions; and *The Option Strategy Evaluator,* a program that calculates the results of option transactions involving combinations of put and call purchases and sales. Radio Shack Stores nationwide, tapes 49.95

The Great USA, a 16/32K educational game for grades four and up, designed to teach children the abbreviations for the 50 states, their capitals, and the official nickname, bird, tree and flower for each state. The 32K version includes two colorful maps — one of the eastern USA and the other of the western USA which enables the user to learn the shapes, location, relative sizes and official abbreviations for each state from these maps. Sugar Software, 2153 Leah Lane, Reynoldsburg, OH 43068, tape $19.95

Comp-u-trace, a graphics aid/screen overlay kit that enables the user to improve art scale and form, trace art and programs, create originals, and design game layouts without requiring artistic ability. The kit includes three reusable vinyl screen overlays, a special grease pencil with extra color leads, full instruction booklet that applies to the Color Computer and is adaptable to any system, a 16K demo cassette with 11 graphic pictures, and an on screen location graph program. All Event Video Productions, 333 Cirby Way, Suite 55,Roseville, CA 95678, tape $29.95

Snoopy and the Red Barron, a 16/32K game for two players. Objective: One player is Snoopy, the other is the Red Barron. Shoot your opponent through the clouds, scoring the most hits in the allotted time detemined at the beginning of the game. S&S Arcade Supplies, 8301 Sarnow Drive, Orlando, FL 32802, tape $18.95

Federation Bootcamp, a 16/32K game. Objective: You have been drafted into the Galactic Space Federation and must go through basic training which includes the performance of four tasks, four different times — each time being harder than the time before, and after completion becoming a Space Cadet. S&S Arcade Supplies, 8301 Sarnow Drive, Orlando, FL 32807, tape $18.95

Sonar Search, a 16/32K game for one or two players. Objective: Try to sink ships using sonar and depth charges, by first searching through the scope position on the screen and firing until all enemy ships are destroyed. S&S Arcade Supplies, 8301 Sarnow Drive, Orlando, FL 32807, tape $18.95

Golf, a ML game for the Dragon 32 with three skill levels for 1-4 players. Objective: Choose your club and direction, and avoid sand traps and duck ponds in this golf game. Micro Deal, 41 Truro Rd.,St. Austell, Cornwall PL25 5JE, tape $8.00

Frogger, a ML game for the Dragon 32 for one or two players. Objective: Cross the highway without getting hit; cross the river without falling in while avoiding snakes, crocodiles and turtles, and maneuver the frog home within the given time. Micro Deal, 41 Truro Rd., St. Austell, Cornwall, PL25 5JE, tape $8

Cuthbert Goes Walkabout, a ML game for the Dragon 32. Objective: Turn the lights on by walking across the switches before the invading Moronians get you. Micro Deal, 41 Truro Rd., St. Austell, Cornwall, PL25, 5JE tape $8

Morocco Gran Prix, a ML game for the Dragon 32. Objective: Race the Gran Prix to be first to finish in this 100 mile race. Micro Deal, 41 Truro Rd., St. Austell, Cornwall, PL25 5JE tape $8

The Dragon Composer, a four-voice music compiler for the Dragon 32 which allows the development of music. *The Composer* features seven octave range and supports dotted and double dotted notes as well as eighth, quarter and standard triplet notes. Allows music to be played in any tempo or key. Micro Deal, 41 Truro Rd., St. Austell, Cornwall, PL25 5JE, tape $15

Space Shuttle, a flight simulation game for the Dragon 32 for one player. Micro Deal, 41 Truro Rd., St. Austell, Cornwall, PL25 5JE, tape $8

A Parent's Guide To Personal Computers & Software, an 8½ X 11-inch, 64-page, ring-bound softcover consumer guide book with four-color photographs and all the information about personal computers in the marketplace. Consumer Guide, Publications International, Ltd., 3841 W. Oakton Street, Skokie, IL 60076, $6.95

The *Seal of Certification* program is open to all manufacturers of products for the TRS-80 Color Computer, the TDP-100, or the Dragon-32, regardless of whether they advertise in *the Rainbow*. By awarding a *Seal,* the magazine certifies the program *does exist*, but this *does not* constitute any guarantee of satisfaction. As soon as possible, these hardware or software items will be forwarded to *the Rainbow's* reviewers for evaluation.

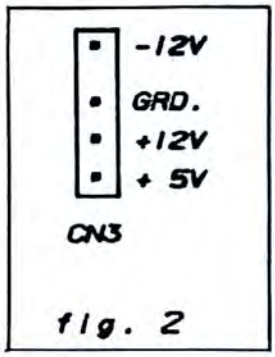
—Jutta Kapfhammer

CORRECTIONS

In William R. Hall's "Custom Interface for the Gemini 10" (November 1983), the configuration in Figure 2 is slightly off. The correct illustration is reproduced on this page. Also, the final parenthetical paragraph of the article was omitted. It noted that:

(Kits are available from Dayton Associates of W.R. Hall, Inc., 7201 Claircrest Drive, Bldg. C, Dayton, OH 45424, phone 513-236-1454.
Printed Circuit with Mounting hardware & CN2 connector $12
Complete Kit $19
Assembled and tested $29
C.O.D. add $2

We apologize for any inconvenience this oversight may have caused.



John "Crazy" Fraysee reports, "I found one small mistake in the *Marathon* listing (October 1983). Line 73 should begin: 73 RS=RS+**500** . . . rather than 540." If you continue to use the value of 540, it will be impossible to exceed a score of 15,750. Bonus play should be awarded every 5,000 points.

Coco Headquarters

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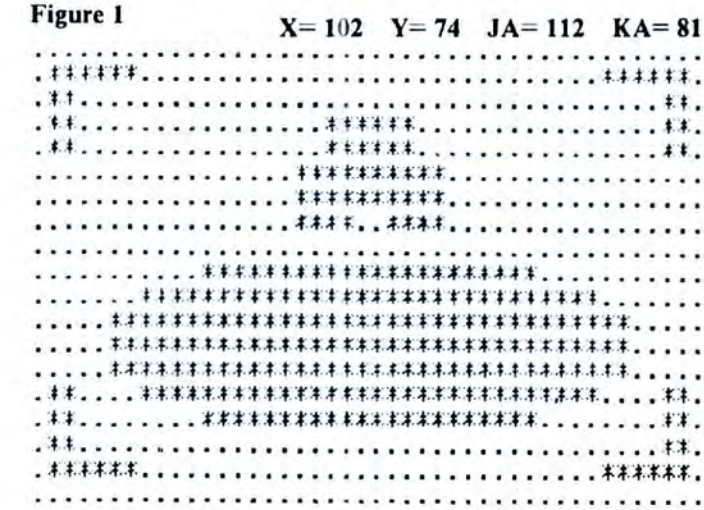
Coco Headquarters

In Jim Griffin's *Shutter Bug* (October 1983), both Table 1 and Figure 1 were omitted. These are reproduced on this page for your reference. Also, Jim has pointed out that his program requires 16K ECB and will not work in 4K. We regret this mistake by *the Rainbow*.

Table 1

BC	— Background colored cursor
C	— Counter for game score
CX	— X coordinate of cursor position
DD	— Degree of difficulty
DX	— X coordinate of UFO destination
DY	— Y coordinate of UFO destination
E	— Exposures
H1	— High score for DD 1
H2	— High score for DD 2
H3	— High score for DD 3
HP	— Horizontal penetration of viewfinder into UFO array
J	— X coordinate read from joystick
JA	— X coordinate of joystick for drawing viewfinder
JK$	— Initial positioning for *DRAW* statements
K	— Y coordinate read from joystick
KA	— Y coordinate of joystick for drawing viewfinder
M1(?)	— Counter digits
M2	— Digit subscript
M3	— Digit value
MA(?)	— Modifiable address
MD	— UFO movement delay factor
N(?)	— Numerals for graphic display in counters
P1	— Position of first digit in counter display
P2	— Position of last digit in counter display
P3	— Digit identifying factor
PT	— Points (scoring) table
S(?)	— Sound variable
T	— Time duration for sound
TT	— Total time allowed under selected DD
U	— UFO
VP	— Vertical penetration of viewfinder into UFO array
X	— X coordinate of UFO
Y	— Y coordinate of UFO
YC	— Yellow colored cursor

Figure 1



The HJL-57 Keyboard



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Offering more than full-travel, bounce-proof keyswitches, the HJL-57 has RFI/EMI shielding that eliminates irritating noise on displays; and four user-definable function keys (one latchable), specially-positioned to avoid inadvertent actuation.

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Your HJL-57 kit includes usage instructions and decimal codes produced by the function keys, plus a free sample program that defines the function keys as follows: F1 = Screen dump to printer. F2 = Repeat key (latching). F3 = Lower case upper case flip (if you have lower case capability). F4 = Control key; subtracts 64 from the ASCII value of any key pressed. Runs on disc or tape; extended or standard Basic.

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- Birmingham — Software City
- Florence — Anderson News Co.
- Huntsville — Software City
- Madison — Madison Books
- Mobile — Computerland
- Montgomery — Trade 'N' Books

ALASKA
- Anchorage — Radio Shack
- Fairbanks — Electronic World
- Kotzebue — Arctic Bookstore, Inc.

ARIZONA
- Glendale — Road Runner Computer Products
- Mesa — Personal Computer Place
- Mesa — Personal Computer Place
- Mesa — Software Center
- Phoenix — Home Brew Computers
- Phoenix — The Computer Shop
- Phoenix — Software City
- Phoenix — Tri-Tock Computers
- Scottsdale — Data Concepts
- Scottsdale — Softwareland Corp.
- Sierra Vista — Livingston Books
- Tempe — All Systems Go
- Tempe — Books Etc.
- Tempe — Computer Library
- Tucson — Anderson News Co.
- Tucson — Software City

ARKANSAS
- Little Rock — Anderson News Co

CALIFORNIA
- Atwater — Electrobrain
- Citrus Heights — Software Plus
- Downey — The Floppi Disk
- El Cajon — Radio Shack
- Exton — Software City
- Fortuna — R&V Sound
- Half Moon Bay — Strawflower Electronics
- Hollywood — Levity Distributors
- Lancaster — Alpha Computer Equip. Co.
- Los Angeles — OPAMP Technical Books
- Modesto — Software Mart
- Morro Bay — Coast Electronics
- National City — Willy's Electronics
- Northridge — HW Electronics
- Pacific Beach — Pro Am Electronics
- Palo Alto — Printers, Inc.
- Sacramento — North Area News
- Sacramento — Softwaire Conter
- San Diego — Computer Dimension
- San Diego — The Computer Store
- San Diego — Cost Plus Software
- San Diego — Dimensional Software
- San Diego — Disney's Electronics
- San Diego — Radio Shack
- Santa Rosa — Software 1st
- Southgate — Color Computing
- Sunnyvale — Computer Literacy
- Torrance — Softwaire Centre Int.
- 29 Palms — Adobe Electronics

COLORADO
- Aurora — Aurora Newsland
- Boldar — The Computer Connection
- Colorado Springs — Hathaway's Magazines
- Denver — Wholelife Dist.
- Westminster — Software City

CONNECTICUT
- Danbury — Computer Serv. of Danbury
- Hartford — The Aetna Life Club Store
- Orange — Software City

DELAWARE
- Wilmington — Normar, Inc.—The Smoke Shop

DISTRICT OF COLUMBIA
- The Program Store

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- Clearwater — Soonen & Wilmoth Books
- Cocoa — Space Coast Software
- Coconut Creek — Data Base
- Ft. Lauderdale — Mike's Electronics Distributor
- Ft. Lauderdale — Software Connection
- Kissimmee — Radio Shack & Elec. Hut
- Longwood — Adventure International Store
- Miami — Joe's News
- Miami — Micro Byte
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GEORGIA
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- Atlanta — Guild News Agency
- Atlanta — Hands On Computer
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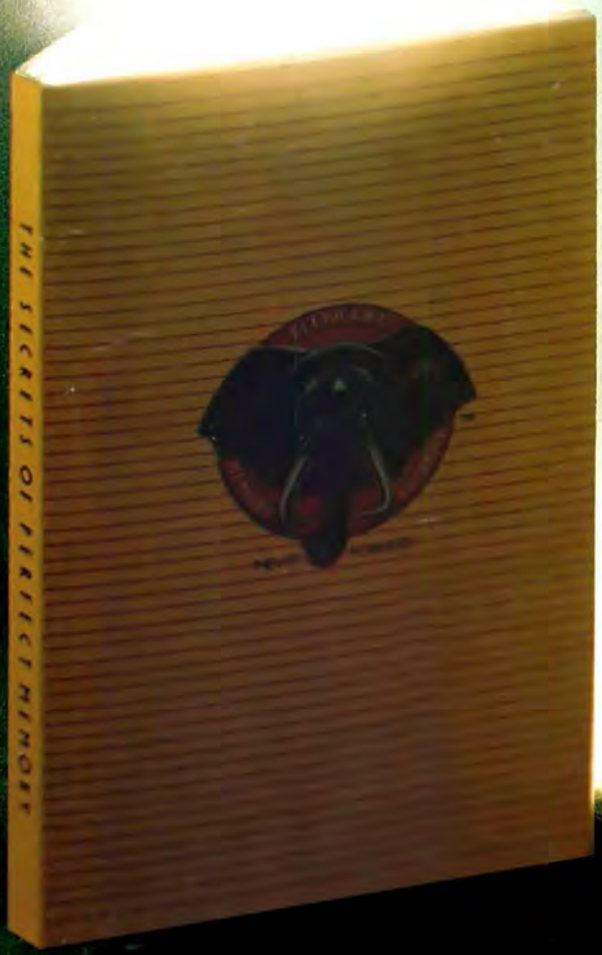
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